PB83-214700

EPA Evaluation of the Malpassi Filter King Device Under Section 511 of the Motor Vehicle Information and Cost Savings Act

(U.S.) Environmental Protection Agency
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DISCLAIMER: Portions of this document are not fully legible.

16. ABSTRACT

This report announces the conclusions of the EPA evaluation of the "Malpassi Filter King" device under provisions of Section 511 of the Motor Vehicle Information and Cost Savings Act.

The evaluation of the "Malpassi Filter King" device was conducted upon receiving an application from the marketer. The device is a gasoline pressure regulator. The "Malpassi Filter King" device is claimed to save gasoline by improving the fuel economy of carburetor-equipped, automotive engines.

EPA fully considered all of the information submitted by the applicant. The evaluation of the "Malpassi Filter King" device was based on that information and EPA's engineering judgement. While it is probably true that some fuel can be wasted as a result of overenrichment due to sloshing and late closing of the float valve, there is no evidence that such losses are significant or that this device can minimize them. Thus, there is no technical basis for EPA to support the claims made for the device or to perform confirmatory testing. Moreover, there remains some concern for the effect of the device on driveability and safety.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Fuel Consumption Motor Vehicles Tests	Fuel Economy Fuel Regulator	

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by
Stanley L. Syria

January 1983

Test and Evaluation Branch
Emission Control Technology Divison
Office of Mobile Sources
U.S. Environmental Protection Agency

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SPRINGFIELD, VA. 22161

EPA Evaluation of the Malpassi Filter King Device Under Section 511 of the Motor Vehicle Information and Cost Savings Act

The Motor Vehicle Information and Cost Savings Act requires that EPA evaluate fuel economy retrofit devices and publish a summary of each evaluation in the Federal Register.

EPA evaluations are originated upon the application of any manufacturer of a retrofit device, upon the request of the Federal Trade Commission, or upon the motion of the EPA Administrator. These studies are designed to determine whether the retrofit device increases fuel economy and to determine whether the representations made with respect to the device are accurate. The results of such studies are set forth in a series of reports, of which this is one.

In 1977, the marketer of the Malpassi Filter King submitted an application for an EPA evaluation of the device. EPA evaluated the device and determined that while there may be fuel economy benefits for some vehicles, these would be offset by certain driveability and safety problems. That conclusion was based on various tests conducted for the marketer by American Motors Corporation (AMC).

Since that evaluation, the marketer has contended that the Agency's conclusions were inappropriate because the device had been incorrectly installed on the test vehicle during a portion of the AMC tests. For this reason, the marketer requested that EPA reconsider the facts and reevaluate the device.

The Agency did reconsider all available information and determined that the device may have been installed incorrectly during most, if not all of the tests. Additionally, the test vehicle was not representative of the current population and the test procedures followed would not likely show the true benefits of the device. Some on-the-road test data from the marketer and the theory of operation also suggested there may be fuel economy benefits. For these reasons, the Agency decided to reevaluate the device. Accordingly, the marketer submitted a new application in February, 1982. The device, which has not changed since EPA's first evaluation, is claimed to improve fuel economy and engine performance. It is classified by EPA as a fuel pressure regulator.

The following is a summary of the information on the device as supplied by the Applicant and the resulting EPA analysis and conclusions.

1. Title:

Application for Evaluation of Malpassi Filter King under Section 511 of the Motor Vehicle Information and Cost Savings Act

2. Identification Information:

a. Marketing Identification of the Product:

"This device is marketed under the name of Malpassi Filter King. The die casting which makes up the upper half of each unit shows the following information - Filter King - Fuel Pressure Regulator - Patented - Made in Italy - Malpassi - Seregno."

b. Inventor and Patent Protection:

(1) Inventor

"The inventor is Remo Malpassi, Via Montello 56, 20038 Seregno, Italy."

(2) Patent

"A copy of U.S. Patent 3695438, dated 1972, [See Attachment A of this evaluation.] is contained in the Blue Book[1]. The patent was taken out by Alberto Malpassi."

c. Applicant:

(1) Name and address

Techimport Limited
119 Glen Road
Toronto, Canada M4N 2W1

(2) Principals

"The principal officers of this company are R. H. Scrivener, President, and P.F. Coulter, Vice-President, both of Toronto."

(3) "Techimport Limited will be represented by - R. H. Scrivener, 119 Glen Road, Toronto, Ontario, Canada M4N 2W1; telephone 416-924-2813."

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[1]The "Blue Book" was submitted with the application. It contains a number of documents related to design and performance of the device. Because of its size, the Blue Book has not been reproduced as an attachment to this evaluation. Instead, appropriate excerpts have been included. Individuals may obtain additional information on the contents of the Blue Book by contacting EPA at the address listed after the Conclusion Section of this report.

d. Manufacturer of the Product:

(1) Name and address

"The device is presently manufactured by Malpassi in Seregno, Italy.

"If sales volume became large enough, the device would be manufactured in the U.S.A."

(2) Principals

"The principal officer and owner of Malpassi is Alberto Malpassi."

3. Description of Product:

a. Purpose:

"The purpose of the Malpassi Filter King is to save gasoline by improving the fuel economy of carburetor-equipped, automotive engines."

b. Theory of Operation:

[The Malpassi Filter King is claimed to reduce and regulate fuel pressure to the carburetor float bowl in such a way as to eliminate the detrimental effects of fuel sloshing and pressure pulsations which occur during conventional vehicle operation.

A more lengthy description of its theory of operation as supplied by the applicant is found in Attachment B.]

c. Construction and Operation:

"The manner of operation of the Malpassi Filter King is fully described in the material filed with respect to U.S. Patent 3695438, which also contains a schematic diagram. [See Attachment A.]

"Of particular note is the large area of the diaphragm which ensures very precise control of the outlet pressure at all flow rates and complete damping of the fuel pump generated pressure pulsations in the fuel line. The degree of fuel filtering provided by the large filter and its bowl is superior to that provided by most original equipment. The flow control valve, which is operated by the diaphragm and the spring, makes its seal by means of a neoprene "O" ring which ensures tight closure and long life.

"The unit is well made of the best materials - mainly brass, stainless steel and aluminum - and it will easily outlast the vehicle on which it is installed."

d. Specific Claims for the Product:

"The principal claim made for the Malpassi Filter King is that it saves gas.

"Because of the infinite variation in the performance of automobile engines - even between identical makes and models - and the added variable of the driving habits of individual drivers, we do not claim a specific percentage fuel saving. We prefer to indicate that the average improvement in fuel economy should lie somewhere between 10 and 15 per cent. We leave it up to the buyer to decide if he is satisfied with his improvement in fuel economy. Therefore, if for any reason he is not satisfied after a 30-day trial period, his money is refunded without queston.

"A further claim is made that the use of the Malpassi Filter King improves engine performance, i.e. that the engine will operate more smoothly at the lower outputs. The improvement of performance was the original objective behind the development of the Malpassi Filter King, but it was soon found that improved performance equated to better fuel economy. Now, fuel savings have become the prime benefit.

"Our basic claim may be summarized as a fuel saving of around ten (10) percent, without penalty with respect to engine performance or risk of engine damage or interference with the functioning of emission control devices."

[The balance of Section 3.d addresses supporting test data and has therefore been relocated as Attachment C.]

e. Cost And Marketing Information:

"The only sales of the Malpassi Filter King in the United States have been related to minor marketing research studies.

"The actual cost of the Malpassi Filter King will depend upon the marketing method selected. The likely cost to the user would appear to lie between $49.95 and $59.95. Installation would be extra.

"Until we have approached potential marketers, we are not sure of the final marketing method."

4. Product Application, Installation, Operation, Safety and Maintenance:

a. Application

(1) "The Malpassi Filter King is applicable to all automotive engines which operate on gasoline and have a carburetor in which the flow of fuel is controlled by a float/float valve system.

"The Malpassi Filter King cannot be used with gasoline engines having fuel injection systems or with diesel engines.

"Only one model - No. 4 - is marketed in North America. This model can be set to deliver fuel to the carburetor at any pressure between 1.50 and 3.75 pounds per square inch. As received from the factory, the units are set to give an output pressure of 2.25 pounds per square inch, which suits most of the cars on the road. If the owner wishes, the unit can be "tuned", i.e., the outlet pressure modiffed by turning the screw at the top, as set out in the Fitting Instructions [See page 3 of Attachment D]. Often, tuning increases the fuel savings by two or three percentage points."

(2) "The operation of the Malpassi Filter King is not affected by types of driving, weather or topographical differences.

"According to Professor Huf (Blue Book), the Malpassi Filter King is particularly effective during travel through high mountains and under extreme climatic conditions."

b. Installation - Instructions, Equipment, and Skills Required:

"Installation instructions are packed with each unit. A copy of these instructions is included in the Blue Book. [See Attachment D of this evaluation.]

"The unit comes complete with all materials required to install it in the engine compartment of the vehicle, e.g. hoses, clamps, mounting bracket, bolts and self-tapping screws.

"The installation of the unit requires little skill and usually takes about half an hour. Simple tools such as a screwdriver, pliers, a small wrench, a sheet metal drill and a tube cutter are all that is required.

"The Malpassi Filter King is merely inserted in the fuel line, at a convenient point, between the carburetor and the fuel pump. The installation instructions deal, also, with special

situations, e.g. in the case of AMC vehicles, the unit is installed between their filter/return line assembly and the carburetor.

"The unit can be installed as received from the factory, without adjustment. Or, if the owner prefers, the unit can be "tuned" to optimize fuel savings.

"The installation of the Malpassi Filter King does not require adjustment to any part of the engine."

c. Operation:

"The installation instructions contain sections dealing with operation and maintenance.

"The only maintenance required is the annual changing of the corrugated paper filter in the aluminum bowl attached to the underside of the unit."

d. Effects on Vehicle Safety:

"The reports of the testing of the Malpassi Filter King by the Air Resources Board of California confirm that the operation of the unit does not change the air/fuel ratio of the mixture delivered by the carburetor to the engine. Therefore, there is no risk, even at the lowest possible setting, of "lean burn" and engine damage. Nor is there any danger to the occupants of the vehicle.

"The unit is always in use and we have had few reports of any malfunctions. Occasionally, an owner will lose the adjusting screws but the engine will continue to function.

"As the Blue Book records, the Malpassi Filter King is standard factory equipment on a number of vehicles. Some of these have very expensive engines, so that it would be unlikely the manufacturers would use the unit if there was the slightest chance of damage or fall-off in performance."

e. Maintenance:

"The only maintenance required is the annual changing of the fuel filter which is contained in the aluminum bowl attached to the underside of the unit.

"The use of the Malpassi Filter King does not effect the normal maintenance of the engine. However, because minor flooding is much reduced by its use, the interior of the engine remains relatively free of carbon and spark plugs remain clean over long periods."

5. Effects on Emissions and Fuel Economy:

a. Unregulated Emissions:

"The Malpassi Filter King was thoroughly tested by the Air Resources Board of California and cleared for sale in that State. The ARB testing and their 1981 re-evaluation of the unit are covered in detail in the Blue Book. [See Attachments E-1 through E-3.] In general terms, the ARB concluded that the Malpassi Filter King did not cause additional contaminents to be released to the air and that it did not interfere with the functioning of automotive emission control devices".

b. Regulated Emissions and Fuel Economy:

"The fuel economy effects of the Malpassi Filter King have been dealt with in 3.d. Specific Claims. [The supporting test information in Section 3.d has been relocated to Attachment C for the readers convenience.]

"The various reports of the Air Resources Board of California have been reproduced in full in the Blue Book." [See Attachments E-1 through E-3.]

6. Testing by EPA:

EPA did not conduct confirmatory testing of the device for this evaluation because the test data submitted by the applicant did not adequately support the claims made for the device.

7. Analysis

a. Identification Information:

Marketing Identification: EPA's only concern with the marketing identification is that the model number apparently is not marked on the device. The Agency believes it should be located on the device even though only one of several models is currently marketed in North America (according to Section 4.a.(1) of the application).

b. Description:

(1) The primary purpose of the device, as stated by the applicant, is to "save gasoline by improving the fuel economy of carburetor-equipped, automotive engines". Based upon the description and theory of operation of the device, the Agency finds no problem with the statement.

(2) The theory of operation given in Section 3.b. of the application was judged to be adequate. It appears the device is intended to control the fuel pressure and thereby prevent overfilling of the carburetor float bowl and consequential overenrichment of the air-fuel mixture.

(3) The description of the device given in U.S. Patent 3695438 was judged to be adequate. Additionally, the device appears to be constructed of appropriate materials, i.e., brass, stainless steel, and aluminum. Because a sample was not examined, the Agency could not judge the quality of manufacturing associated with the device.

(4) The device is claimed to improve fuel economy and performance of carbureted engines. The applicant claims that on the average, fuel economy will improve by 10 to 15 percent. The applicant supports this claim by stating that if the buyer is not satisfied with the device after a 30 day trial period, the buyer's money will be refunded without question. Despite the guarantee made, the applicant did not submit adequate data to substantiate such claims. Thus, without additional information and test results, EPA cannot determine if the claims are reasonable.

(5) The cost of the device, as given by the applicant, is between $50 and $60. EPA estimates that installation time would be from 30 to 60 minutes and assuming a shop rate of $20 per hour, the installation cost would be an additional $10 to $20. Thus, total cost would be between $60 and $80. Assuming a 10% improvement in fuel economy with costs of $70 per device and $1.40 per gallon of fuel, a vehicle averaging 20 MPG would have to be driven about 11,000 miles to recover the cost.

c. Application, Installation, Operation, Safety and Maintenance:

(1) Applicability:

The stated applicability of the product appears to be appropriate.

(2) Installation - Instructions, Equipment and Skills Required:

The installation instructions (Attachment D) submitted by the applicant were judged to be quite thorough. Additionally, the applicant's statement that the

installation requires little skill and only simple tools was also judged to be accurate. Overall, based on the design of the device and the adequacy of the installation instructions, EPA does not expect purchasers to experience difficulty when installing the device.

(3) Operation:

EPA agrees that the device can function properly and will not require any controlling action by the driver.

(4) Effects on Vehicle Safety:

Since the device is to be installed in the fuel line, there are some fire hazards associated with its installation and use. With proper installation, check-out and periodic inspections, there should be no unusual danger. On the other hand, the Agency is concerned about potential driveability problems during hard accelerations and high temperature conditions. Since the device is intended to significantly reduce fuel pressure, it may aggravate the tendency for vapor lock. This, in turn, will affect engine performance (e.g., hesitation, stalling, etc.).

The reader should note that the Agency's conclusions given in the final report during its first evaluation of the Malpassi Filter King in 1977 were that the "device did not benefit the nation because of driveability and safety problems associated with it". This conclusion was reached after learning that the device had caused driveability problems during hot weather testing of the device by American Motors Corporation (AMC). Subsequent to the release of the Agency's final report, the applicant presented enough information to cause the Agency to decide the device may have been installed incorrectly during part or all of the AMC testing[2]. For this reason, the Agency decided the driveability problems noted during the AMC tests were perhaps unjustly attributed to the device. The applicant was notified (Attachment F) that during EPA's reevaluation of the device, the Agency would not base its conclusions on the AMC test results and that it intended to evaluate the driveability characteristics associated with the device. EPA also suggested in the same letter that an

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[2]The installation instructions state that for those vehicles having an in-line filter/return line assembly, the device must be installed between the assembly and the carburetor. It appears that during the AMC testing program, the device was installed between the assembly and the fuel pump. Consequently, fuel pressure was overly reduced.

independent test facility evaluate driveability under "hot soak" conditions at temperatures above 90°F. However, the applicant did not submit the required test data. For this reason, EPA does not have data showing whether or not there is a safety related problem associated with the device. Because of the design of the device (and not because of AMC's test results), the Agency is concerned about the safety aspects of the device.

(5) Maintenance:

The applicant states the only maintenance required is the annual changing of the fuel filter which is contained within the device. The applicant also states the spark plugs remain clean over a longer period of time. EPA judges that replacement of the fuel filter is not likely to be a difficult task to perform. With respect to the spark plugs remaining clean, EPA judges that should the device indeed be capable of lowering emissions and improving fuel economy, then it seems plausible that the combustion chamber (and spark plugs) should remain clean longer. However, the applicant did not provide any test data or any other evidence to substantiate that statement and therefore, EPA cannot support that claim.

d. Effects on Emissions and Fuel Economy:

(1) Unregulated Emissions:

The applicant states that the device had been tested by the Air Resources Board of California (ARB) and that the test data was contained within the Blue Book. That data (Attachments E-1 through E-3) showed that ARB tested the device with respect to regulated, not unregulated emissions. EPA notified the applicant of this fact and requested that he submit information for unregulated pollutants (Attachment F). The applicant did not respond to the Agency's request.

Although appropriate information was not submitted, it is EPA's engineering judgement that based on the design of the device, the Malpassi Filter King is unlikely to adversely affect unregulated pollutants.

(2) Regulated Emissions and Fuel Economy:

The applicant did submit test data (see Attachments C and E-1 through E-3) to support the claims made for the device. EPA evaluated the data and noted several problems associated with it. These concerns were expressed to the applicant in two letters (Attachments F and G) and are summarized as follows:

(a) AMC Test Data

1. Testing was performed on a chassis dynamometer. This stationary operation is unlikely to reveal the full potential of the device due to the relatively small amount of fuel bowl sloshing during the test.

2. The fuel line system on the AMC vehicle tested was not representative of the population of in-use vehicles.

3. Only one vehicle was tested and an inadequate number of complete tests were performed. Therefore, statistically sound results were not possible.

4. Some test results were obtained using models of the device other than that covered by the current application for evaluation.

5. The device appears to have been installed incorrectly on the test vehicle during some or all of the tests.

(b) ARB Test Data

The ARB test data consisted of steady-state tests performed on one vehicle. Although the tests were adequate for ARB purposes, they did not entirely satisfy EPA's test requirements. That is, because of the absence of fuel bowl "sloshing" during steady-state testing, the ARB data did not show the capability of the device in controlling instances of overenrichment. Therefore, fuel economy benefits attributable to the device could not be accurately determined.

With respect to exhaust emissions, it is EPA's engineering judgement that based on its design, the device should not have an adverse effect on either emission levels or on emission control systems regardless of fuel bowl "sloshing". For this reason, even though there was an absence of "sloshing" during ARB's testing, that data was judged to be adequate in showing the effect of this device on emissions. That data showed the device did not significantly change the emission levels for either hydrocarbons, carbon monoxide, or nitrogen oxides.

(c) Independently Conducted On-Road Tests

Of the 47 test results submitted, most were inadequate because of one or more of the following reasons:

1. Unrepresentative vehicles.

2. Insufficient number of vehicles tested.

3. Replicate testing not performed.

4. Inadequate control of test variables.

5. Back-to-back testing not performed.

Although most of the test results were not adequate, there were a few that were satisfactory enough to suggest that there may be fuel economy benefits associated with the device and that additional testing should be conducted to confirm whether the benefits were real. EPA assisted the applicant in developing a test plan which would provide well controlled on-road data.

The applicant was requested repeatedly (Attachments F, G, and H) to provide the additional test data required, however, he failed to do so. The applicant notified the Agency he was arranging to have the device tested in Michigan by Bendix Corporation but had encountered a number of delays in working out the testing arrangements. Despite the delays, the applicant indicated he still intended to obtain the required data. The applicant had been given ample time (more than eight months) to submit the required test data but by this time, winter had arrived. Its adverse and unstable conditions are not conducive to on-road testing. Rather than delay the evaluation awaiting better weather, the Agency notified the applicant (Attachment I) that it was completing its evaluation of the device using all available information. He was extended the invitation to reapply for another EPA evaluation as soon as he obtained adequately controlled test data which substantiated his claims. Subsequently, the applicant notified EPA that Bendix Corporation would not be testing his device and that he was instead working out testing arrangaements with Southwest Research Institute (SwRI) in San Antonio, Texas. He further stated the testing might possibly be finished by Christmas or shortly thereafter (another 1 1/2 to 2

month delay). The Agency notified the applicant that it would proceed with its final evaluation report and any data submitted prior to its release would be considered and may be incorporated in the report. By March 1, the report was ready for release and data had not yet been submitted by the applicant. The Agency tried contacting the applicant in a final effort to determine if test data was about to be submitted. However, thus far the Agency has not been able to reach him. The Agency also checked with SwRI to see if testing had been performed. SwRI stated the applicant was sent a proposed test plan in mid-January but that he had not responded. Thus, with no data immediately forthcoming, the Agency decided to release its report.

8. Conclusions

EPA fully considered all of the information submitted by the applicant. The evaluation of the Malpassi Filter King device was based on that information and EPA's engineering judgement. While it is probably true that some fuel can be wasted as a result of overenrichment due to sloshing and late closing of the float valve, there is no evidence that such losses are significant or that this device can minimize them. Thus, there is no technical basis for EPA to support the claims made for the device or to perform confirmatory testing. Moreover, there remains some concern for the effect of the device on driveability and safety.

FOR FURTHER INFORMATION CONTACT: Merrill W. Korth, Emission Control Technology Division, Office of Mobile Sources, Environmental Protection Agency, 2565 Plymouth Road, Ann Arbor, MI 48105, (313) 668-4299.

List of Attachments

Attachment A	Copy of U.S. Patent No. 3695438
Attachment B	Excerpt from Section 3.b. of the application for evaluation containing the theory of operation of the device.
Attachment C	Excerpt from Section 3.d of the application for evaluation containing supporting test results.
Attachment D	Copy of installation instructions (excerpt from Blue Book).
Attachment E-1	Copy of Air Resources Board of California Executive Order D-79, April 17, 1978.
Attachment E-2	Copy of Air Resources Board of California Executive Order D-79-1, January 12, 1979.
Attachment E-3	Copy of Air Resources Board of California Executive Order D-79-3, April 1, 1981.
Attachment F	Copy of letter from EPA to Techimport Limited, April 20, 1982.
Attachment G	Copy of letter from EPA to Techimport Limited, June 24, 1982.
Attachment H	Copy of letter from EPA to Techimport Limited, July 22, 1982.
Attachment I	Copy of letter from EPA to Techimport Limited, November 8, 1982.

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See Claim P. 65-1

16.

ATTACHMENT A

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3695438

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Whereas, THERE HAS BEEN PRESENTED TO THE

Commissioner of Patents

A PETITION PRAYING FOR THE GRANT OF LETTERS PATENT FOR AN ALLEGED NEW AND USEFUL INVENTION THE TITLE AND DESCRIPTION OF WHICH ARE CONTAINED IN THE SPECIFICATION OF WHICH A COPY IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PATENT OFFICE IN THE CLAIMANT (S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID CLAIMANT (S) IS (ARE) ADJUDGED TO BE ENTITLED TO A PATENT UNDER THE LAW.

NOW, THEREFORE, THESE **Letters Patent** ARE TO GRANT UNTO ...D SAID CLAIMANT (S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID ...IMANT (S) FOR THE TERM OF SEVENTEEN YEARS FROM THE DATE OF THIS ...NT, SUBJECT TO THE PAYMENT OF ISSUE FEES AS PROVIDED BY LAW, THE ...HT TO EXCLUDE OTHERS FROM MAKING, USING OR SELLING THE SAID INVENTION ...OUGHOUT THE UNITED STATES.

In testimony whereof I have hereunto set my hand, and caused the seal of the Patent Office to be affixed at the City of Washington this third day of October, in the year of our Lord one thousand nine hundred and seventy-two, and of the Independence of the United States of America the one hundred and ninety-seventh.

Attest:

GASOLINE PRESSURE REGULATOR DEVICE

BACKGROUND OF THE INVENTION

The present invention relates to a petrol or gasoline ressure regulator device which is of particular, but not sclusive, use in motor vehicles.

It is known that in motor vehicles the fuel (petrol) ntained in the vehicles fuel tank is passed to the car-uretor and thence to the explosion chamber by a ump called the petrol pump.

Since the thrust exerted on the fuel by the pump is ntinuous or fluctuating, it has for long been sug-ted to interpose a petrol-pressure adjustment mber between the petrol pump and the carburetor. wever, while the known adjustment members have vided improvements in the art, they have been nd to be unsatisfactory for the adjustment of the rol-pressure.

SUMMARY OF THE INVENTION

The main object of the present invention is that of viding a petrol-pressure regulator device which livers a flow of petrol which is adjusted with preci-n, even when the pressure of the petrol arriving at e device is subject to considerable variations, such w being adjustable over a wide range of values in der to satisfy the needs of the members employing e fuel(the carburetor and the engine).

Another object of the present invention is that of viding a petrol-pressure adjustment or regulator ce which adjusts the pressure of the petrol by minating impurities contained in the petrol, the ele-t which eliminates such impurities being replacea-

Another object of the present invention is that of viding a petrol-pressure adjustment device which is mple construction and use.

A further object of the invention is that of providing l-pressure adjustment device which may be duced in relatively small sizes and may be readily ted and mounted in very small spaces.

According to the invention there is provided a l-pressure adjustment device, particularly for vehicles, characterized in that it comprises an stment body and a filter body which are in fluid-t communication through an aperture and a com-nication duct, said adjustment body comprising a t and a second chamber separated by a laminar phragm, said first chamber being substantially ed and said second chamber being in communica-with said filter body through said communication t, said filter body comprising a liquid filter element ged between said aperture and said communica-n duct, a valve member controlling said communica-on duct, resilient holding means and adjustment eans for said valve member, at least one inlet duct nd at least one outlet duct, resilient fixture means ing provided for fixing said filter body to said adjust-nent body.

BRIEF DESCRIPTION OF THE DRAWING

Further characteristics and advantages of the inven-n will appear more clearly from the following tailed description of a preferred embodiment of a eu.l-pressure adjustment device according to the in-

vention, illustrated by way of example in the accom-panying drawing, in which:

FIG. 1 is a longitudinal sectional view of a petrol-pressure adjustment device according to the invention;

FIG. 2 is a sectional view, to an enlarged scale, of a valve portion of the device of FIG. 1;

FIG. 3 is a perspective view of the same petrol-pressure adjustment device; and

FIG. 4 is a view in an enlarged scale, of a valve element according to a further embodiment thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to the figures, 1 indicates the regulator body of the petrol-pressure regulator device, 2 indicates a filter body removably attached thereto and 3 indicates a valve member interposed between the bodies 1 and 2. The device has an inlet union 4 which communicates through a duct 5 with the interior 6 of the filter body 2. In the body 1 of the device, substantially formed in two pieces 1*a* and 1*b*, there are provided a first and a second chamber 7 and 8, respectively, which are separated by a laminar diaphragm 9. The air chamber 7 is substantially closed. The position of the laminar diaphragm 9 may be adjusted by means of an adjustment screw 10. The head of the screw 10 is covered by a cap 11 and a spring 12 is arranged between the screw 10 and the diaphragm 9.

The filter body 2 is in fluid-tight communication with the body 1 through a gasket 13 and is maintained in position by a U-shaped tie-rod whose ends are engaged in the body 1 and whose central portion is engaged in the tang 15 of the filter body 2. The body 2 internally carries a filter member 16 of the replaceable cartridge kind, comprising filter surfaces (not shown) arranged in 17 between end plates 18 and 19 and the cylindrical cavity 20. Against the lower end plate 18 of the filter member 16 there acts a spring 21. The upper end plate 19 of the filter 16 has a circular hole adjacent a communication passage 22 between the body 2 and the body 1. As is clearly shown in FIG. 2, said communication passage 22 includes a cylindrical seat 23 for the valve member 3 and a relative thrust spring 24. The upper end of said seat 23 has a conical tapered portion which opens into a cylindrical duct 26 whose upper end communicates with a apertures 27, provided in the number 27a which also forms guiding means for the valve stem 30.

The valve member 3 substantially comprises a generally cylindrical valve cone having an annular groove retaining an O-ring gasket 29, a central projecting shoulder 28 whose upper face is in abutting engagement with the O-ring gasket 29, the upper surface of said annular 29 being in engagement with the conical tapered portion 25 of said communication path 22. The upper end of the valve member 3 terminates in a pin 30 which engages the laminar diaphragm 9. The resilient gasket 29 has the advantage of providing a better fluid-tight seal than other seal elements, such as the known use of two conical metal surfaces.

Reference numeral 31 indicates the outlet or delivery duct of the petrol-pressure adjustment device, and reference numeral 32 indicates the connection union for said delivery duct.

FIG. 3 diagrammatically shows a petrol pump 33 and a carburetor 34 which are connected to the inlet union 4 and the outlet union 32, respectively.

The working of the petrol-pressure adjustment device according to the embodiment will now be described.

The petrol pump 33 passes fuel under pressure into the internal space 6 of the filter body 2 through the duct 5. Such fuel (petrol) passes through the filter elements 17 to the cylindrical space 20 and thence, through the communication duct 22 controlled by the valve member 3, into the chamber 8. The fuel then leaves the chamber 8 through the outlet union 32 and passes into the carburetor 34. Since the fuel under pressure which is delivered by the pump 33 has a substantially fluctuating pressure, the chamber 8 will be forced to expand or contract, like a lung, under the action of the fluctuating pressure of the fuel passing into the chamber 8 through the duct 22. In particular, the expansion of said chamber 8 causes the compression of the spring 12 through the laminar diaphragm 9, while in the contraction of the chamber 8, the spring 12 forces the diaphragm 9 downwards, reducing the volume of the chamber 8.

Evidently the lowering of the diaphragm 9 causes the lowering of the valve member 3 and, consequently, the controlled opening of the communication duct 22. It follows that the pressure of the fuel in the chamber 8 depends almost exclusively on the rate of flow of fuel required by the carburetor 34, and is independent of the pressure applied to the fuel by the pump 33 upstream of the petrol-pressure adjustment device. In this way the device provides the carburetor and the explosion chamber with a flow of fuel which does not fluctuate and is stable in all driving conditions. Differences in climate and altitude in which the motor vehicle finds itself are compensated by the reaction of the diaphragm 9. The petrol-pressure adjustment device can provide a delivery pressure of up to five times that necessary for supplying the carburetor with the normal quantity of fuel.

The characteristics described above lead to a saving in fuel of from 10 to 15 percent with respect to similar motor vehicles which do not employ an adjustment device according to the invention.

Now considering FIG. 4 in detail, where the same elements as in FIG. 2 are indicated with the same reference numbers, the valve element consists of an intermediate frusto-conical member or section 35, to the bases of which there are rigidly connected the stem member or pin 30 at the smaller base and the annular shoulder 28 respectively, which radially projects over the larger base thereto.

On the annular shoulder 28 at the side opposite the frusto-conical section 35 a spring 24 also acts. The latter rests at the other end thereof against a shoulder defined by the seat 23 becoming narrower towards the communication passage 22.

At the frusto-conical section 35 of the valve element the side wall of the passage 22 is formed with an annular cavity 36 arranged to receive a toroidal gasket 37 in such a manner, however, as to cause the latter to project through a substantial portion of its inner and lower surface over its seat. The inner diameter of the gasket 37 is selected so as to be smaller than the maximum diameter of the frusto-conical section 35.

While considering now the operation of this valve in detail, it may be seen that the frusto-conical section 35, in the closed condition, first makes contact along a circumference with the fixed gasket 37, the said contact taking place when the gasket is not in contact with the shoulder 28 yet. Upon a further closing operation the section 35 causes the gasket to expand due to said surface having a greater diameter than the gasket 37. Sealing is also provided by the pressure contact between the shoulder 28 and the gasket in the lower portion.

Conversely the conical surface permits a more uniform adjustment of the passage opening relative to the movement of the valve element.

For carrying out the elements forming the pressure adjuster according to the invention the used materials could be any according to requirements.

I claim:

1. A pressure regulator device, particularly for regulating gasoline pressure in motor vehicles, of the character comprising a regulator body and a filter body removably attached thereto, a first and a second chamber provided inside said regulator body, a diaphragm inside said regulator body separating said first and second chamber from each other, an inlet for gasoline into said filter body, means defining a communication passage between said second chamber and said filter body, valve means inside said communication passage for opening and closing said communication passage, said valve means having a valve stem cooperating with said diaphragm, resilient means urging said diaphragm and said valve stem against each other and an outlet for gasoline from said second chamber and wherein, according to the improvement said valve means comprises a generally cylindrical valve cone body axially movable inside said communication passage and rigid with said valve stem, an annular groove in said valve cone body, a projecting shoulder on said valve cone body adjacent said groove and having two opposite faces, resilient means inside said communication passage bearing with one end thereof against one of said faces of said projecting shoulder and connected with other end thereof to said regulator body, an annular gasket means retained within said annular groove and abutting against the other of said faces of said projecting shoulder, said means defining said communication passage having a frusto-conical portion cooperating with said annular gasket means in sealing off said communication passage when said generally cylindrical valve cone body is in its closing position and guiding means for said stem of said valve means.

* * * * *

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United States Patent

Malpassi

[15] 3,695,438

[45] Oct. 3, 1972

[54] GASOLINE PRESSURE REGULATOR DEVICE

[72] Inventor: Alberto Malpassi, Via Montello 56, Seregno, Italy

[22] Filed: July 6, 1970

[21] Appl. No.: 52,627

[30] Foreign Application Priority Data

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Feb. 14, 1970 Italy 20863 B/70

[52] U.S. Cl. 210/137, 210/430
[51] Int. Cl. B01d 29/36
[58] Field of Search 210/137, 430

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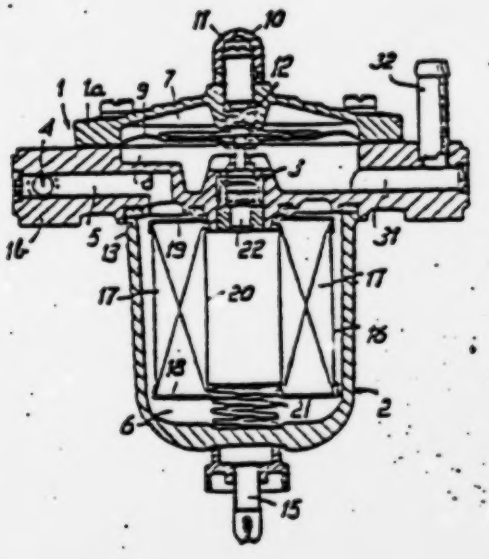
Primary Examiner—John Adee
Attorney—Guido Modiano and Albert Josif

[57] ABSTRACT

A petrol or gasoline pressure regulator device, particularly for motor vehicles, comprising a regulator body with two chambers separated by a diaphragm and a valve member controlling a communication duct to one of said chambers and acting on said diaphragm, the combinated effect of said valve member and of said diaphragm controlling the pressure of the petrol or gasoline inside said regulator body.

1 Claim, 4 Drawing Figures



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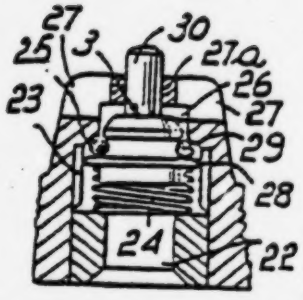

Fig. 2

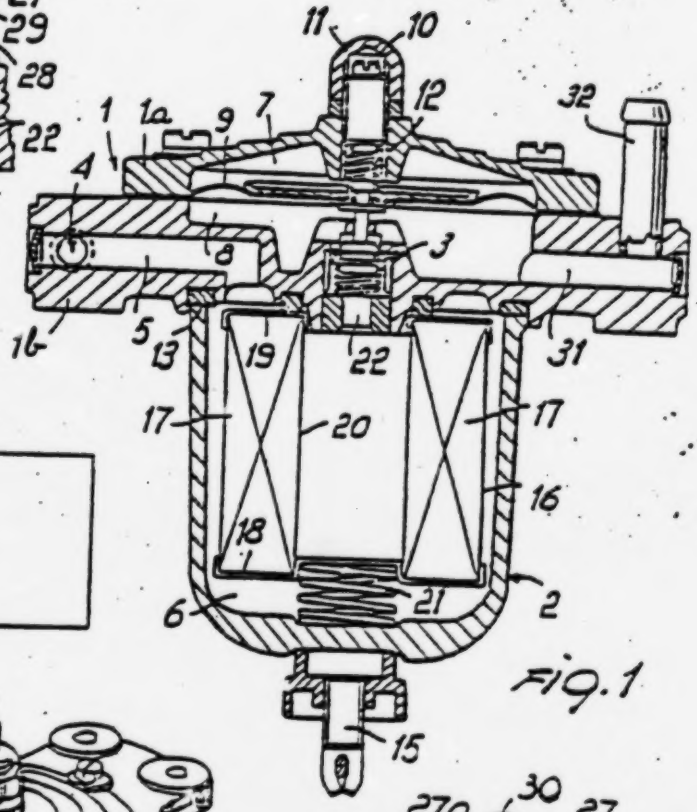

Fig. 1

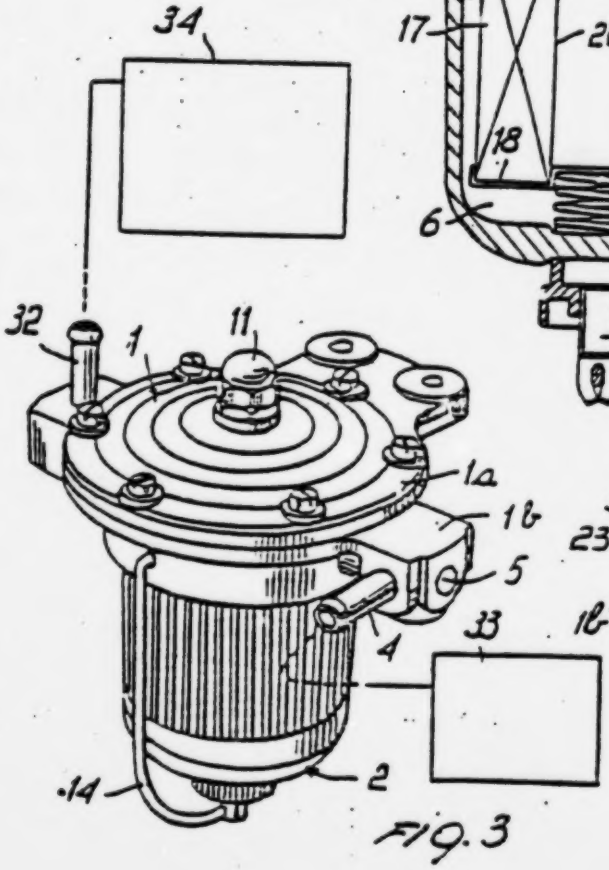

Fig. 3

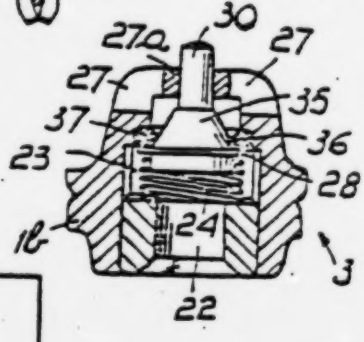

Fig. 4

INVENTOR
Alberto MALPASSI
BY
AGENT

ATTACHMENT A

Patent on device not submitted due to poor legibility.

Information contained in Patent No. 3,695,438 available upon request.

ATTACHMENT B

[The following information is an excerpt from
Section 3b of the application]

In most automobile engines which operate on gasoline, the fuel is drawn from the fuel tank and delivered to the carburetor by a pump which may be either mechanically or electrically driven. The amount of fuel supplied by the pump is controlled by the float and the float valve in the carburetor float bowl. When fuel is consumed, the float bowl level falls and the float drops, opening the valve which admits fuel to the float bowl. As this flow of fuel restores the level in the float bowl, the float rises and closes the float valve, thus shutting off the flow of fuel from the pump. The intent of this arrangement of float and float valve is to hold the level of the fuel in the float bowl at the chosen design height and thus allow the carburetor to function at maximum efficiency. As power demand increases from idle to maximum, the level in the float bowl falls slightly because the float valve must be opened an increasing amount to provide an increased flow of fuel into the engine.

Automotive fuel pumps present the fuel to the carburetor float valve at pressures ranging from three (3) to nine (9) pounds per square inch, which are considerably in excess of those actually needed. At pressures of this magnitude, the opening of the float valve allows the fuel to enter the carburetor in spurts, and any failure of the float and float valve to properly reflect the correct amount of fuel required will cause the float bowl level to rise above the design point. Any fuel admitted to the float bowl, after the fuel level reaches the design point, immediately results in an overrich mixture which wastes fuel. Such a condition is equivalent to continuing to operate an automobile with the choke partly on.

Two influences act to cause the float to drop and thus admit fuel to the float bowl - first, consumption of fuel by the engine and, second, the 'sloshing' of the fuel in the float bowl caused by the lateral forces due to accelerating, braking and cornering. When the fuel 'sloshes' in the float bowl, the float action becomes erratic and float valve opening is unrelated to actual fuel requirements, with the result that the spurts of high pressure fuel which are admitted by the valve are continually overfilling the float bowl with consequent wastage of fuel.

Apart from high pressure, the very nature of the flow of fuel between pump and carburetor creates a problem. The pressure of the fuel fluctuates with each stroke of the pump. In addition, when the float valve is closed, the expansion and contraction of the butane bubbles in the fuel stream cause cyclic reversals in

the direction of flow, i.e. the fuel actually flows backward during the suction stroke of the pump. At the high pump delivery pressures, such pressure pulsations have a hammering effect upon the carburetor float valve, which can lift it off its seat.

The effect of fuel sloshing in the carburetor bowl and the matter of fluctuations in pressure and flow direction downstream of fuel pumps is clearly set out in an address made by Wilfred Baatz of the FlowScan Instrument Company Inc. to the Society of Automotive Engineers in February, 1976. Part of this address is given in the Technical Section of the Blue Book.

The adverse effect of pressure pulsations created by the fuel pump is discussed by Stockel in his Auto Mechanics Fundamentals.

Further references to the effects of float bowl slosh and pressure pulsations are given in Rochester Carburetors by Rowe and Fisher and in Holley Carburetors and Manifolds by Urich and Fisher.

Parts of the above three books are reproduced in the Blue Book.

The high pressure at which the fuel is delivered to the carburetor, together with the pressure pulsations created by the pump in the fuel line flow, combine with the effect of the fuel 'sloshing' in the float bowl to create recurring periods of flooding of the carburetor which, in turn, result in corresponding periods of over-rich mixture.

The purpose of the Malpassi Filter King is to reduce the pressure of the fuel reaching the carburetor to minimum pressure actually needed to supply adequate fuel and, thus, minimize the amount of excess fuel entering the carburetor during periods of erratic float action due to the 'sloshing' of the fuel in the float bowl.

Also, the large diaphragm in the device acts to eliminate the pressure pulsations generated by the fuel pump and, thus, the fuel is presented to the carburetor at a rock-steady pressure, with laminar flow characteristics, at all flow rates.

In practice, the pressure of the fuel delivered to the carburetor is reduced to about two (2) pounds per square inch, the exact pressure being adjusted to suit the particular requirements of the automobile. This pressure is more than ample to supply the fuel needs to the largest automobile engine. The Air Resources Board of California found that, at 1-1/4 pounds pressure (the lowest possible pressure setting), there was no "leaning" of the air/fuel mixture, and, thus, no possibility of 'lean burn' damage to the engine.

The net effect of the functioning of the Malpassi Filter King is to permit the carburetor float and float valve mechanisms to function more effectively, as intended by their designer, and thus reduce the incidence and severity of overfilling of the carburetor float bowl, with its associated over-rich fuel mixture and consequent fuel wastage. Thus, the only aspect of carburetor operation which is affected by the Malpassi Filter King is the elimination of the peaks of over-rich fuel mixture, which would otherwise recur constantly.

The carburetor is by no means the perfect instrument for providing the correct air-fuel mixture to the engine, at all times. But, when fuel is supplied at a steady, lower pressure, it is able to perform its intended function more effectively and consistently. This benefit from fuel pressure regulations has been recognized for many years and is mentioned in the standard texts dealing with carburetor operation.

The comments of Professor Huf on the effectiveness of the Malpassi Filter King, which are contained in the Blue Book, will be of special interest. Professor Huf, a leading European expert on internal combustion and the designer of the gas turbines used by the German air force during the last war, was retained by the Noldeke firm to advise them as to which of the several available 'fuel saving devices' they should adopt for marketing. He recommended the Malpassi Filter King.

In practical terms, the results of many tests in many countries and the experience of some two million users show that the use of the Malpassi Filter King Fuel Pressure Regulator will, on the average, reduce fuel consumption by about ten per cent. These fuel savings are achieved without penalties in the form of either loss of engine performance or risk of engine damage.

A similar outline of the theory of operation of the Malpassi Filter King is contained in the Technical Section of the Blue Book.

[The following information is an excerpt from
Section 3.d of the application]

The claims made for the Malpassi Filter King, with respect to fuel savings, are based upon and have been confirmed by a mass of independently-conducted test work. Two examples of such test work are given below -

(i) American Motors Corporation -

In September, 1977, AMC carried out a series of 23 city-highway CVS dynamometer tests and achieved a six (6) per cent improvement in economy without any 'real world' operating problems.

As the staff of EPA has confirmed that the test work carried out by AMC is quite as acceptable as that done by the test laboratories recommended by EPA, the result of the AMC test program must be accepted as valid and representative of the fuel-saving capabilities of the Malpassi Filter King, under the particular conditions of the tests.

It should be mentioned that, under the conditions of dynamometer testing, the lateral forces which act upon the carburetor float bowl to cause fuel-wasting 'fuel bowl slosh', i.e. acceleration forces due to

3. d. Specific Claims - cont'd

(i) American Motors Corporation - cont'd

braking, accelerating and turning, are not present as they would be if the tests were conducted 'on road'. In other words, dyanmometer testing eliminates a source of fuel wastage with which the Maplassi Filter King is designed to deal. Therefore, for basic reasons, the fuel savings obtained by dynamometer testing will be smaller than if the same vehicle had been tested on the road. Thus, the six (6) per cent improvement observed by AMC would be almost doubled if the vehicle had been tested on the road.

The absence of lateral forces and, therefore, of 'fuel bowl slosh' during dynamometer testing is one of the reasons why fuel mileage figures derived on the dynamometer cannot be duplicated when the same vehicle operates under 'on road' conditions.

The AMC conducted a further test of the Malpassi Filter King under what is described as a 'hot soak' test and reported that problems were encountered - "... several problems after a 20 minute hot soak. In fact, the test vehicle runs out of fuel at about 45 mph on a wide open throttle acceleration."

However, if we refer to Rochester Carburetors by Rowe and Fisher, we find on page 222 - 'One other situation that rises occasionally is a result of hot soaking during brief stops. It is a fuel-flash condition. If a car is run at expressway speeds in hot weather then stopped for 5 to 20 minutes, restarted and accelerated at WOT back to highway speeds it may falter and die out momentarily if the fuel is high in vapours'.

As all the fuel would have boiled and evaporated from the carburetor during the 20 minutes of AMC's Yuma desert hot soak, it it quite normal for the engine to stall if accelerated at WOT to 45 mph.

The fitting instructions for the Malpassi Filter King state specifically that, with the AMC vehicles, the unit must be installed between the AMC filter/return and the carburetor. During AMC's hot soak test, the unit was installed between the fuel pump and the filter/return. The Malpassi Filter King does not function at its best when installed in this manner and users are warned to avoid it.

In any event, considering the common occurrence of stalling under hot soak conditions, the AMC Yuma desert hot soak test has no relevance to the fuel saving capabilities of the Malpassi Filter King.

From the foregoing, it can be seen that, under the test conditions specifically established by EPA for the evaluation of retro-fitted fuel

3. d. Specific Claims - cont'd

(i) American Motors Corporation - cont'd

saving devices, the Malpassi Filter King has proved it is capable of producing an improvement in fuel economy of six (6) per cent. As explained above, this fuel saving is equivalent to about 12 per cent under actual on-road driving conditions.

(ii) Independently Conducted On-Road Tests -

In our files, we have the results of a large number of independently conducted, on-road fuel economy tests of the Malpassi Filter King.

Last May, we selected 47 such tests and passed their details and results to the Office of Energy Savings of the Government of Quebec for statistical analysis. The results provided ranged from the very low to high but the criterion for selection was that those conducting the tests should be considered capable of maintaining accurate records of fuel and mileage.

This statistical analysis showed that, in 9 cases out of 10, the potential for gasoline saving, through the use of the Malpassi Filter King, ranged from 9 to 13 per cent, on an annual basis.

The conclusions of this analysis were subsequently examined and confirmed as correct by Professor Garneau of the University of Montreal.

While we recognize the difficulty of achieving the precision of dynamometer tests under on-road conditions, yet the on-road tests reflect the effect of fuel bowl slosh on fuel economy and the dynamometer tests do not. Also, most of the on-road tests were continued over a period of time and over substantial mileage which would enhance their accuracy.

These on-road tests involved many drivers, a wide range of vehicle types and makes and many thousands of miles of regular vehicle use. Under these 'real world' conditions, the Malpassi Filter King showed a consistent pattern of significant fuel savings, without one instance of interference with the normal performance of the vehicle.

In the AMC CVS test program, the Malpassi Filter King demonstrated good fuel savings, without any real world problems. As these tests conformed in all respects to the requirements set up by the EPA, it

3. d. Specific Claims - cont'd

(ii) Independently Conducted On-Road Tests - cont'd

follows that adequate proof of significant fuel saving capability has been provided to the EPA.

The results of the AMC Yuma desert 'hot soak' test are commonplace and have no relevance to the fuel saving capabilities of the Malpassi Filter King. To apply such a test to the Malpassi Filter King would be to discriminate against it.

While the AMC tests showed that the Malpassi Filter King could save fuel under the laboratory conditions specified by the EPA, the results of the many on-road tests showed that these results were repeatable outside the laboratory and even larger savings could be achieved with good consistency.

[This is an excerpt from the Blue Book]

May, 1979

IT MAY BE BORING, BUT-
PLEASE READ THESE INSTRUCTIONS CAREFULLY BEFORE INSTALLING OR ADJUSTING THE FILTER KING. IT IS IMPORTANT TO KEEP THESE INSTRUCTIONS FOR FUTURE REFERENCE.

FITTING AND ADJUSTING INSTRUCTIONS:

1. FITTING

The Filter King comes with all the parts necessary to fit the unit onto your vehicle, i.e. mounting bracket, nuts and bolts, self-tapping screws, hose clamps and connecting hose. Since the Filter King has to be connected into the metal fuel line coming from the fuel pump (usually located at one side of the engine block) to the carburetor, the Filter King should be mounted as close as possible to the part of the fuel line to which it is to be connected. The unit must not be mounted on the engine or too close to a source of heat, e.g., the exhaust manifold.

Before assembling the unit and mounting bracket, check that the glass bowl is being held tightly against its seal, and if necessary, tighten the bowl retaining knob. Bolt the mounting bracket to the Filter King, using the two nuts and bolts together with the two flat washers and lock washers.

Locate the mounting point nearest to the intended 'splice-in' point into the metal fuel line. Depending on the position of the fuel line, these locations are normally: the inside of the fender well, the lip where the fender is bolted to the automobile, on the cowling at each side of the radiator, (keeping the unit and hose well away from the radiator itself and the fan), and the passenger compartment bulkhead. On vans and trucks other mounting locations are: the lip of metal at the body end of the hood, or the grillwork at the front of the engine compartment. In many cases, there will be a nut and bolt securing another piece of equipment to the body, which can be unbolted, the mounting bracket inserted, and the nut and bolt retightened. There may be holes already drilled but not used which can be utilized. If no such readily available fixing holes exist, you can drill or punch two small holes at the mounting location and then use the two self-tapping screws and flat washers supplied to attach the mounting bracket and Filter King to the car.

Make sure that the selected mounting location is free from any excess vibration. The mounting bracket can be bent and twisted in order to use an awkward mounting location.

Remember that every 10,000 - 12,000 miles, the filter in the glass bowl must be changed, so allow for the removal of the glass bowl either by mounting the unit far enough away from any engine or body part beneath it to allow for removal "in situ" or for easy removal of the whole unit by using a nut and bolt to hold the mounting bracket to the mounting locations. The filter is changed by undoing the plastic nut at the base of the glass bowl. This will enable the retaining loop to be slipped over the glass bowl, allowing the bowl to drop free. When inserting the new filter, make sure that it is the correct way up, i.e. hole upwards, and ensure that both rubber sealing rings are in place.

The Filter King need not be absolutely vertical, but do not mount the unit horizontally or upside down. Filtration will work most efficiently with the unit

upright. Do not mount the unit in a place where it could get hit by stones thrown up from the road. This could lead to a cracked bowl and gasoline leakage.

In some cases, in particular the larger automobiles, due to the amount of underhood equipment, the only available mounting location may be some distance from the connecting point to the metal fuel pipe. In this case, it may be necessary to purchase an extra length of hose from auto-parts supplier. Be careful not to route the tubing so that it touches any hot engine parts, or so that it comes into contact with any chafing object. The type of engine will also have an effect on the mounting location in the following way. Most Ford engines have a metal fuel line which stops an inch or so from the carburetor. The metal fuel line is connected to the carburetor by a short length of rubber hose. By removing the air filter, it is possible to take out this length of rubber hose, leaving a gap into which the tubing from the Filter King can be connected.

On some other vehicles, there is an in-line fuel filter connected into the metal fuel pipe, shaped like a small drum. This is connected to the metal fuel pipe by a rubber hose at each end. If this filter is removed, the Filter King tubing can then be connected into the resulting gap. In these cases, the Filter King should be mounted as close as possible to the gap in the metal fuel line. In the case of vehicles with a 'return line' from the in-line fuel filter to the fuel tank, i.e. most A.M.C. vehicles, Ford Pintos, Toyotas, etc., connect the Filter King between the in-line filter and the carburetor, leaving the filter and return line intact.

If the metal fuel line has no breaks in it from the fuel pump to the carburetor, as in most GM models, then it will have to be cut, either with a hack-saw or a tube cutter. Ideally, the pipe should be removed from the engine and cut at the appropriate place with a tube cutter. If this is not practical, and it is not possible to use a tube cutter, a hack-saw can be used to cut the metal fuel pipe.

Do not cut the metal fuel pipe while the engine is hot. Let the engine cool completely to avoid any possibility of the gas leaking from the cut pipe and igniting.

If you use a hack-saw, try to find a place in the line which is vertically inclined. This will cut down the chance of metal filings being carried into the carburetor and causing the inlet-needle-valve to stick open. If this does occur, gasoline will flood out of the carburetor. This can be cured, in most cases, by tapping the carburetor at the point where the metal fuel line enters it, thus clearing the blockage.

Most G.M. vehicles have a paper filter contained in a 'bell housing' where the fuel line connects to the carburetor. After cutting the fuel line in order to attach the Filter King, leave this filter in place for a few miles of driving. Any metal filings will then be trapped, and later are thrown away with the filter.

Ensure that no jagged edges are left on the cut fuel line. The hose supplied should now be measured for correct length and cut to size. (The length is measured between the Filter King and the connecting point of the metal fuel line). The inlet and outlet nozzles on the Filter King are clearly marked on the underside, close to the nozzles, in raised lettering. Make sure that they are connected the right way. The nozzle pointing downwards connects, via the hose supplied, to the metal fuel line going to the fuel pump. The nozzle pointing horizontally connects, via the tube

supplied, to the line going to the carburetor. If any difficulty is experienced in getting the hose to go over the fuel line, the hose end can be stretched by placing it in boiling water. The hoses, now connected in the correct manner to the metal fuel lines, should now be clamped into place, both at the connections to the metal fuel lines and the two nozzles, using the four clamps supplied. Make sure that the clamps are reasonably tight. Ensure that there are no sharp bends in the connecting hose. This may restrict or entirely cut off the fuel supply to the carburetor, causing hesitation and stalling.

Check once more that everything has been connected safely and correctly.

Start the engine and check for any leaks. Drive the car a few blocks and then check again for leaks.

2. TUNING

Like the carburetor, the Filter King can only be pre-set at the factory to an approximately correct setting. The final tuning can only be done once the Filter King is mounted on the car, and is operational. At the top of the Filter King is a domed nut. If this is unscrewed and taken off, a screw will be seen. This screw is the adjusting screw and is held tight by a lock nut. To make adjustments, the domed nut must be removed and the lock nut slackened. By unscrewing the adjusting screw (anti-clockwise) a drop in output pressure to the carburetor is obtained. By screwing the adjusting screw in (clockwise) an increase of pressure to the carburetor is obtained. Do not adjust the pressure setting unless the fuel economy gain is less than 10%, in which case unscrew the adjusting screw counter-clockwise by half a turn at a time.

In the event that an increase in fuel economy is not obtained by decreasing the Filter King output pressure from the original pressure setting, the procedure should be reversed and the output pressure setting adjusted by steadily increasing amounts above the original output pressure setting. In order to accomplish this, a note of the number of turns anti-clockwise made in originally adjusting the unit output pressure downwards should be made, so that the output pressure of the unit may be re-set to the original pressure before employing the adjustment procedure for increasing the output pressure above that point.

If the performance of the car under maximum fuel demand periods, i.e. heavy acceleration and high speed cruising suffers as a result of installing the Filter King, e.g. hesitation on acceleration, screw in the adjusting screw clockwise by half a turn at a time until the symptoms disappear. In principle, the further out the adjusting screw is turned, (counter-clockwise), the greater the economy gain. There will come a point however, when the performance of the car will suffer, in which case, the adjusting screw must be turned in (clockwise) a half a turn at a time until the car performs properly again. At that point, the optimum point for fuel economy will have been reached, consistent with proper engine performance. When the adjusting screw is turned too far out (counter-clockwise) it will become loose. Be careful it doesn't come out because the spring beneath it will jump out and probably get lost.

3. CONCLUSION

If the Filter King is installed in accordance with these instructions, a minimum 10% improvement in m.p.g. should be obtained. The performance of the vehicle should also be noticeably improved, i.e. easier starting, better idling,

improved acceleration and smoother gear changing. If your automobile is fitted with an in-line filter downstream of the Filter King (between the unit and the carburetor) replace it with a new filter in the case of Ford vehicles which are fitted with filters that screw into the side of the carburetor. Remove and do not replace all other in-line fuel filters with the exception of those with 'return lines' to the fuel tank referred to in Section 1.

Remember that in order to assess the true increase in m.p.g. obtained with the Filter King, you must know fairly accurately what your present gasoline consumption is. Many drivers have the impression that their car does many more miles to the gallon that it actually does. E.P.A. and Transport Canada ratings are not a reliable guide to the actual m.p.g. figures for your car under actual driving conditions.

Your m.p.g. figures will tend to rise and fall with changes in the weather. Winter mileage figures are considerably less than summer figures, due to such things as the prolonged use of the choke as the weather gets colder. Other factors can change your m.p.g. figures significantly, such as crowded traffic conditions, heavy loads in your vehicle, under-inflated tires, etc. The use of the air-conditioner can cost you 2-3 m.p.g.

Should any problems arise that are not covered by these instructions, resist the temptation to play with the Filter King to find out what the problem is. Ring your local Filter King dealer, who will in most cases be able to tell you straight away what the problem is and how to overcome it.

On certain vehicles, mostly G.M. models, a hesitation will be experienced under light acceleration. This, if not accompanied by similar hesitation under heavy acceleration and high speed motoring, is usually due to a defective 'accelerator pump' on the carburetor. This problem, although present beforehand, may not show up until the Filter King is connected, since the excess of gasoline previously present in the carburetor (which the Filter King prevents) will have hidden the effect. To rectify this problem consult your local licensed mechanic.

The Filter King is original equipment on Italian automobiles such as Maserati, Lancia, Lamborghini and Alfa Romeo.

The Filter King is fully warranted against defects arising from faulty material and workmanship for a period of ONE YEAR from the date of purchase. If the unit has been rendered inoperative for any other reason, i.e. tampering, then the guarantee will not apply, and a charge will be made for repairs.

Spare filters may be obtained from your local Filter King distributor or from -

F. K. Products
5 Cottingham Road
Toronto, Ontario
M4V 1B1

ATE OF CALIFORNIA
IR RESOURCES BOARD
02 Q STREET
O. BOX 2815
CRAMENTO, CA 95812

EDMUND G. BROWN JR., Governo

ATTACHMENT E-1

[This is an excerpt from the Blue Book]

April 17, 1978

Mr. Neville Weare
F. K. Products
5 Cottingham Road
Toronoto, Ontario
Canada M4V1B1

Dear Mr. Weare:

The Air Resources Board (ARB) has evaluated the "Filter King Unit No. 5" in accordance with Section 2222, Title 13 of the California Administrative Code. The results of our evaluation are documented in the attached staff report.

It is our opinion that the device does not reduce the effectiveness of any required vehicle pollution control system and therefore complies with the requirements of Vehicle Code Section 27156.

The enclosed Executive Order D-79, grants your device an exemption from the prohibitions of Section 27156 of the California Vehicle Code. I wish to draw your attention to Section 43644 in the Executive Order prohibiting you from advertising your "Filter King" as an air pollution control device.

If you have any questions please call Mr. R. J. Kenny, Manager, Aftermarket Parts Modifications and Evaluation Section, (213) 575-6839.

Sincerely,

Thomas C. Austin
Deputy Executive Officer

Attachment

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-79
Relating to Exemptions under Section 27156
of the Vehicle Code

F.K. PRODUCTS
"FILTER KING UNIT NO. 5"

Pursuant to the authority vested in the Air Resources Board by Section 27156 of the Vehicle Code; and

Pursuant to the authority vested in the undersigned by Section 39515 of the Health and Safety Code and Executive Order G-30A;

IT IS ORDERED AND RESOLVED: That the installation of the Filter King Unit No. 5 manufactured by Alberto Malpassi, Italy, and to be marketed by F. K. Products, 5 Cottingham Road, Toronto, Ontario Canada, M4V1B1 has been found to not reduce the effectiveness of required motor vehicle pollution control devices and, therefore, is exempt from the prohibitions of Section 27156 of the Vehicle Code for installation on 1978 and older gasoline powered vehicles.

This Executive Order is valid provided that installation instructions for this device will not recommend tuning the vehicle to specifications different from those listed by the vehicle manufacturer.

Changes made to the design or operating conditions of the device, as exempted by the Air Resources Board, that adversely affect the performance of a vehicle's pollution control system shall invalidate this Executive Order.

Marketing of this device using an identification other than that shown in this Executive Order or marketing of this device for an application other than those listed in this Executive Order shall be prohibited unless prior approval is obtained from the Air Resources Board.

This Executive Order does not constitute any opinion as to the effect that the use of this device may have on any warranty either expressed or implied by the vehicle manufacturer.

THIS EXECUTIVE ORDER DOES NOT CONSTITUTE A CERTIFICATION, ACCREDITATION, APPROVAL, OR ANY OTHER TYPE OF ENDORSEMENT BY THE AIR RESOURCES BOARD OF ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF THE "FILTER KING UNIT NO. 5."

No claim of any kind, such as "Approved by Air Resources Board" may be made with respect to the action taken herein in any advertising or other oral or written communication.

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best available copy.

Section 17500 of the Business and Professions Code makes untrue or misleading advertising unlawful, and Section 17534 makes violation punishable as a misdemeanor.

Section 43644 of the Health and Safety Code provides as follows:

> "43644. (a) No person shall install, sell, offer for sale, or advertise, or, except in an application to the state board for certification of a device, represent, any device as a motor vehicle pollution control device for use on any used motor vehicle unless that device has been certified by the state board. No person shall sell, offer for sale, advertise, or represent any motor vehicle pollution control device as a certified device which, in fact, is not a certified device. Any violation of this subdivision is a misdemeanor."

Any apparent violation of the conditions of this Executive Order will be submitted to the Attorney General of California for such action as he deems advisable.

Executed at Sacramento, California, this 17th day of April, 1978.

Thomas C. Austin
Deputy Executive Officer

State of California
AIR RESOURCES BOARD

Feburary 24, 1978

Evaluation of the F. K. Products "Filter King Unit No. 5" Device in Accordance with Section 2222, Title 13 of the California Administrative Code

I. Introduction

F. K. Products, 5 Cottingham Road, Toronto, Ontario, Canada, M4V1B1, has applied for an exemption for the "Filter King" device from the prohibitions of Section 27156 of Vehicle Code (See Exhibit A). The device is manufactured by Alberto Malpassi, via Montebello, 56, 20038 Seregno, Italy. The applicant is requesting that an exemption be granted for 1978 and older gasoline powered vehicles.

II. System Description

The "Filter King" device is a fuel pressure regulator installed between the fuel pump and carburetor. It is designed to maintain the proper fuel flow to the carburetor at optimum pressure. The applicant claims that by regulating the pressure to what is actually needed to supply the engine with enough fuel, the device eliminates most or all of the fuel pulsations emanating from the fuel pump. It also prevents excess gasoline from flowing into the float bowl during periods of heavy fuel bowl slosh. As a result, the carburetor is able to maintain a more uniform level of fuel in the float bowl, thereby, reducing carburetor flooding and increasing fuel economy.

The device consists of an upper aluminum housing that contains the fuel inlet and outlet, the valve, and the spring loaded diaphragm that regulates the opening and closing of the valve, the lower glass container that holds the fuel and a high capacity fuel filter. Figure I shows a cross-section of the device.

Initially, fuel under pressure enters the pressure regulator into the glass compartment where the fuel is filtered. The proper amount of fuel is then metered past the valve, thence to the carburetor, by the action of the spring loaded diaphragm.

When the fuel pressure under the diaphragm is high the diaphragm moves up causing the valve to seat against the port reducing the output pressure. When the fuel pressure is low, the diaphragm moved down allowing the valve to open the port thus increasing the output pressure. The modulation of the diaphragm tends to smooth out the fuel pressure pulsation from the fuel pump. The pressure regulator output pressure can be adjusted by means of a screw located on the top of the aluminum housing.

III. System Evaluation

A. Applicant's Submitted Documents - The applicant claims that the installation of the device on the motor vehicle's fuel system will not have any adverse affect on exhaust emissions. The following supporting documents were submitted to the ARB.

1. Evaluation of Filter King Pressure Regulator dated January 3, 1975 by Professor Franz Huf of Polytechnic of Konstanz, West Germany. The tests were conducted on a chassis dynamometer. The report concluded that back-to-back tests, with no vibration induced on the vehicles, showed no change in emissions. With vibration induced on the vehicles (simulating actual road conditions), the emissions decreased with the installation of the Filter King device. Test data was not included in the report but would be made available upon request.

2. American Motors Corporation CVS-75 tests, dated September 30, 1977. Table I summarizes the test results. The test data indicate no significant change in the vehicle emissions when the Filter King was installed and set with fuel output pressure of 1.7 and 1.2 psig.

3. Filter King is used as an original equipment part by several major Italian automobile manufacturers. The fuel output pressure is preset in the factory to "optimize" the effectiveness of the fuel pressure regulation.

B. ARB Tests

The ARB Laboratory evaluation of the device consisted of parametric pressure tests at different speed and engine loading conditions to determine the effect of the Filter King device on a typical carburetor. The purpose was to identify any flow anomalies which might indicate potential conditions which could adversely affect exhaust emissions.

Tests were conducted on a 1976 Canadian Ford 302-2V non-catalyst engine installed on a chassis dyno test stand. The output fuel pressure of the device was adjusted by increments of 0.5 psig from maximum to minimum output allowed by the engine without causing fuel starvation. For each fuel pressure output setting, steady state tests were performed at Idle, 1,000, 1,500, 2,000 and 2,500 rpm with the engine loaded at 25%, 50%, and maximum torque at each speed setting. Fuel flow rates and exhaust emissions were measured and compared to baseline data. Table II summarizes the pertinent test data.

The test results show that the device can regulate fuel pressure from zero to fuel pump output pressure. The minimum pressure output that will not cause perceptible engine fuel starvation is 1.1 psig. At any one pressure setting the device regulates constant output pressure at all engine speed and loading conditions. At any particular combination of engine speed and loading condition, varying the output pressure setting down to 1.1 psig showed no change of fuel flow rate. This indicates the device pressure regulation down to 1.1 psig will not change the carburetor's air fuel mixtures, and consequently will not have any adverse affect on exhaust emissions. Measurements of HC, CO, and NOx exhaust emissions at these test conditions confirmed the above findings.

Since the device will be marketed as an off-the-shelf item, the owner of the vehicle attempting to install the device may set output pressure below the acceptable level which may result in an increase in vehicle emissions. This concern was relayed to the applicant. Subsequently, the applicant stated that the only device to be marketed in California will be Unit No. 5. This unit will be equipped with a modulating spring that will not allow fuel output pressure to fall below 1.25 psig. A sample of the spring was sent to the ARB for testing and was found to have a pressure cut off point of 1.6 psig. Since the spring is designed to have a minimum cut-off point of 1.25 psig, higher than the 1.1 psig found to have no adverse interaction with the carburetor, the ARB anticipates no problem in the field due to the adjustable feature of the device.

IV. Manufacturer's Claims

The applicant claims the installation of the device on vehicles will improve fuel economy up to 15% by reducing carburetor flooding. This statement was based on tests conducted by Prof Franz Huf of Polytechnic of Konstanz, West Germany. These data, however, were not made available to the ARB. Extensive fuel economy tests by AMC (see Table-I) only showed an average of 6% improvement in fuel economy.

It is the staff's opinion that the argument and supporting documents presented by the applicant regarding fuel economy benefits have merit and can be achieved under certain road driving conditions with the installation of the Filter King device.

V. Conclusion and Recommendation

The applicant submitted technical studies and emission tests showing that the installation of the "Filter King" device on typical in-use vehicles would not increase exhaust emissions.

ARB Laboratory flow tests showed that within the device operating range, and under all engine speeds and loading conditions, the fuel flow rates would not change with the installation of the "Filter King Unit No. 5". The device, therefore, would not adversely affect the carburetor's performance and hence no increase of vehicle emissions would result from the use of the device. This was demonstrated by the applicant's and the ARB emission test data.

Therefore, the staff recommends that F. K. Products be granted an exemption from the prohibitions of Vehicle Code Section 27156 for its "Fiter King Unit No. 5" for 1978 and older gasoline powered vehicles.

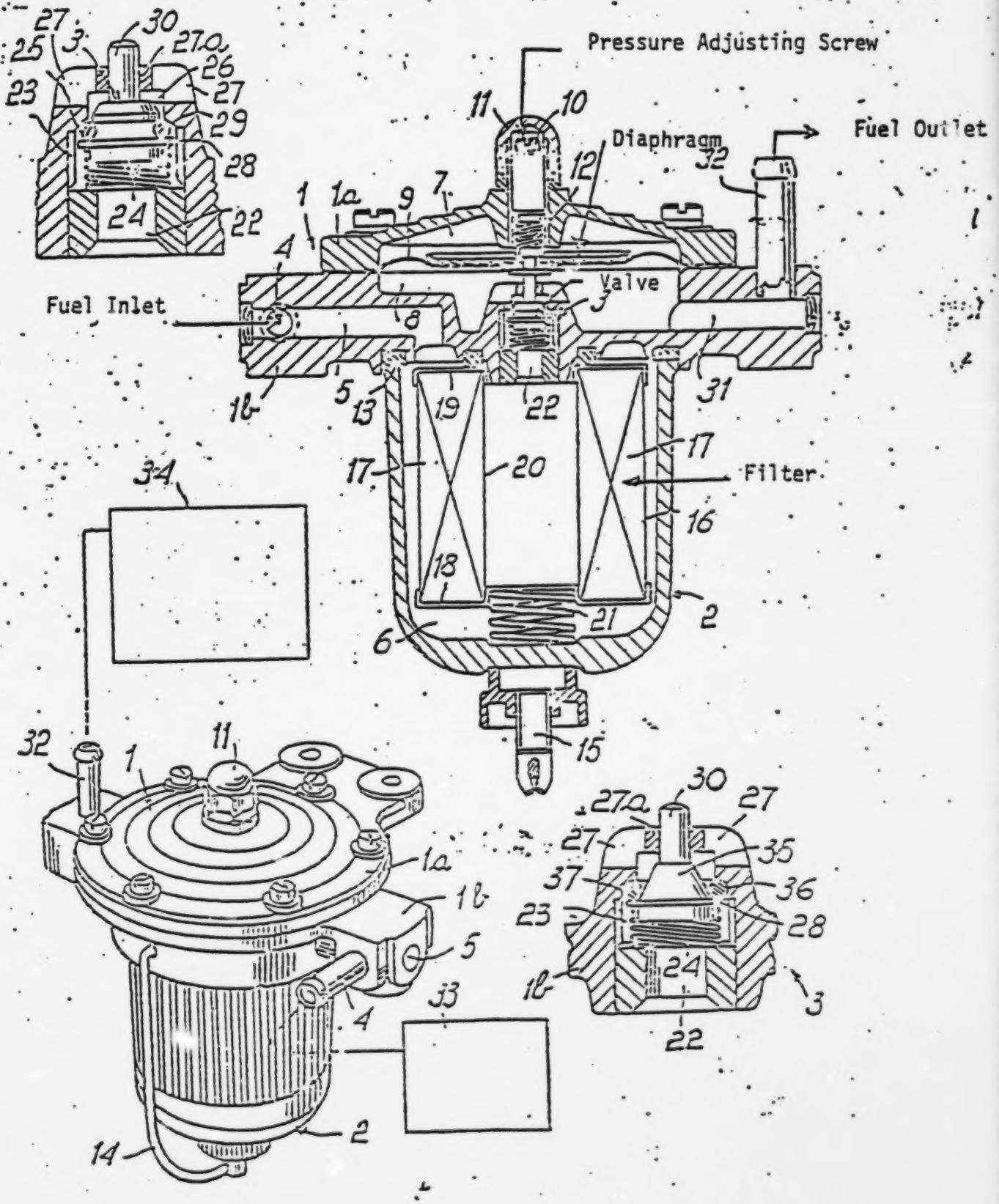

Fig. 1 - Filter King Pressure Regulator

Table I - Filter King Back-to-Back CVS-75 Test Data on a 1978 AMC I-3 Package (Test conducted by AMC)

	Grams per Mile			MPG		
	HC	CO	NOx	City	Highway	Composite
Baseline @ 5 psig.	0.52	5.4	1.23	16.6	25.8	19.8
Filter King @ 1.7 psig	0.49	4.1	1.51	17.5	26.5	20.6
Filter King @ 1.2 psig	0.52	5.0	1.32	17.8	27	21.0

Table - II Parametric Fuel Pressure Tests on Filter King Device on Ford 302 CID Engine Dyno

% of Max. Torque		Idle	100%	50%	25%	100%	50%	25%	100%	50%	25%	100%	50%	25%
Filter King Output Pressure psig	Baseline	5.5	5.1	4.9	4.3	4.4	4.5	4.6	4.2	4.5	4.5	4.2	4.3	4.4
	Device (1)	5.6	5.2	5.5	5.5	3.5	4.2	4.3	4.2	4.4	4.5	4.0	4.3	4.4
	Device (2)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
	Device (3)	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.0	1.9	2.0	2.0
	Device (4)	1.6	1.6	1.5	1.5	1.5	1.6	1.5	1.5	1.6	1.6	1.5	1.5	1.5
	Device (5)	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.1	1.1	1.0	1.1	1.1
Fuel Flow gm/sec	Baseline	0.9	2.7	1.4	1.1	4.2	2.1	1.4	5.8	2.9	1.9	7.2	3.8	2.4
	Device (1)	0.9	2.8	1.4	1.1	4.2	2.2	1.6	5.8	2.9	1.9	7.2	3.8	2.4
	Device (2)	0.8	2.9	1.4	1.1	4.2	2.1	1.4	5.7	2.9	1.8	7.1	3.7	2.4
	Device (3)	0.8	2.7	1.4	1.1	4.2	2.1	1.4	5.9	3.0	1.8	7.0	3.7	2.4
	Device (4)	0.8	2.7	1.4	1.1	4.1	2.1	1.4	5.7	2.9	1.8	6.9	3.7	2.1
	Device (5)	0.8	2.7	1.4	1.1	4.1	2.1	1.4	5.7	2.9	1.8	6.9	3.7	2.4
CO gm/min.	Baseline	0.70	*	1.4	0.8	*	4.1	1.4	*	9.7	2.9	*	21.6	6.7
	Device (1)	0.80	*	1.3	1.0	*	4.2	1.5	*	13.1	2.8	*	17.9	6.4
	Device (2)	0.65	*	1.2	0.9	*	4.7	1.5	*	11.2	2.4	*	17.6	5.0
	Device (3)	0.67	*	1.0	0.9	*	4.0	1.4	*	12.7	2.3	*	19.4	5.7
	Device (4)	0.7	*	0.9	0.8	*	3.2	1.3	*	10.7	2.1	*	16.8	5.5
	Device (5)	0.7	*	0.8	0.8	*	2.8	1.3	*	7.9	1.9	*	14.1	4.1
HC gm/min	Baseline	0.24	2.3	0.73	0.27	3.21	1.32	0.47	4.03	1.52	0.89	5.15	1.76	1.09
	Device (1)	0.26	2.36	0.81	0.28	3.33	1.40	0.51	4.46	1.91	0.98	5.36	1.83	1.12
	Device (2)	0.23	2.35	0.82	0.30	3.11	1.32	0.50	4.21	1.57	0.89	4.9	1.73	1.01
	Device (3)	0.22	2.18	0.79	0.33	3.29	1.38	0.56	4.58	1.84	0.96	4.9	2.07	1.26
	Device (4)	0.29	2.21	0.76	0.31	2.97	1.26	0.53	4.22	1.89	0.76	4.82	2.03	1.28
	Device (5)	0.22	2.10	0.72	0.32	3.13	1.26	0.80	4.16	1.74	0.94	4.74	1.92	1.18
NOx gm/min	Baseline	0.23	*	2.51	0.51	*	4.42	1.28	*	6.33	2.81	*	9.62	5.03
	Device (1)	0.25	*	2.57	0.48	*	4.40	1.36	*	7.34	3.03	*	9.96	5.13
	Device (2)	0.18	*	2.64	0.51	*	4.22	1.34	*	6.05	2.6	*	9.58	4.43
	Device (3)	0.14	*	2.71	0.50	*	2.94	1.96	*	7.44	2.65	*	10.75	4.97
	Device (4)	0.09	*	2.62	0.46	*	4.00	1.21	*	7.10	2.49	*	10.10	4.91

STATE OF CALIFORNIA
EDMUND G. BROWN JR., Governor

AIR RESOURCES BOARD LABORATORY
9528 TELSTAR AVENUE
EL MONTE 91731
(213) 575-6800

ATTACHMENT E-2

[This is an excerpt from the Blue Book]

Reference No. A-79-006

January 12, 1979

Mr. P. F. Coulter
F. K. Products
5 Cottingham Road
Toronto, Ontario
Canada M4V 1B1

Dear Mr. Coulter:

In response to your letters of January 4 and January 5, 1979, we understand that there is no physical difference between Filter King models No. 4 and No. 5. They use the same spring and differ only in pressure setting for marketing purposes.

The enclosed Executive Order, D-79-1, covers both models for 1979 and older vehicles used in California. Please send us a copy of your new advertising material as it becomes available.

If you should have any questions, you may contact Mr. Norman Kayne, Manager, Aftermarket Parts and Modifications Evaluation Section at (213) 575-6839.

G. C. Hass

G. C. Hass, Chief
Vehicle Emissions Control Division

Enclosure

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-79-1
Relating to Exemptions under Section 27156
of the Vehicle Code

F. K. PRODUCTS
"FILTER KING, MODEL NO. 4"
"FILTER KING, MODEL NO. 5"

Pursuant to the authority vested in the Air Resources Board by Section 27156 of the Vehicle Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-45-5;

IT IS ORDERED AND RESOLVED: That the installation of the Filter King Unit No. 4 and Filter King Unit No. 5 manufactured by Alberto Malpassi, Italy and marketed by F. K. Products, 5 Cottingham Road, Toronto, Ontario, Canada M4V 1B1 has been found to not reduce the effectiveness of required motor vehicle pollution control devices and, therefore, is exempt from the prohibitions of Section 27156 of the Vehicle Code for installation on 1979 and older gasoline powered vehicles.

This Executive Order is valid provided that installation instructions for this device will not recommend tuning the vehicle to specifications different from those listed by the vehicle manufacturer.

Changes made to the design or operating conditions of the device, as exempted by the Air Resources Board, that adversely affect the performance of a vehicle's pollution control system shall invalidate this Executive Order.

Marketing of this device using an identification other than that shown in this Executive Order or marketing of this device for an application other than those listed in this Executive Order shall be prohibited unless prior approval is obtained from the Air Resources Board.

This Executive Order does not constitute any opinion as to the effect that the use of this device may have on any warranty either expressed or implied by the vehicle manufacturer.

THIS EXECUTIVE ORDER DOES NOT CONSTITUTE A CERTIFICATION, ACCREDITATION, APPROVAL, OR ANY OTHER TYPE OF ENDORSEMENT BY THE AIR RESOURCES BOARD OF ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF THE "FILTER KING" MODELS.

No claim of any kind, such as "Approved by Air Resources Board" may be made with respect to the action taken herein in any advertising or other oral or written communication.

F. K. PRODUCTS
"FILTER KING, MODEL NO. 4"
"FILTER KING, MODEL NO. 5"

EXECUTIVE ORDER D-79-1
(Page 2 of 2)

Section 17500 of the Business and Professions Code makes untrue or misleading advertising unlawful, and Section 17534 makes violation punishable as a misdemeanor.

Section 43644 of the Health and Safety Code provides as follows:

> "43644. (a) No person shall install, sell, offer for sale, or advertise, or, except in an application to the state board for certification of a device, represent, any device as a motor vehicle pollution control device for use on any used motor vehicle unless that device has been certified by the state board. No person shall sell, offer for sale, advertise, or represent any motor vehicle pollution control device as a certified device which, in fact, is not a certified device. Any violation of this subdivision is a misdemeanor."

Any apparent violation of the conditions of this Executive Order will be submitted to the Attorney General of California for such action as he deems advisable.

Executed at El Monte, California, this 12 day of January, 1979.

G. C. Hass

G. C. Hass, Chief
Vehicle Emissions Control Division

STATE OF CALIFORNIA — EDMUND G. BROWN JR., Governo

AIR RESOURCES BOARD LABORATORY

9528 TELSTAR AVENUE
L MONTE 91731
(213) 575-6800

ATTACHMENT E-3

[This is an excerpt from the Blue Book]

Reference No. A-81-067

APR 1 1981

Mr. R. H. Scrivener, P.E.
119 Glen Road
Toronto, Canada M4W 2W1

Dear Mr. Scrivener:

This is in response to your request for an update of the existing Air Resources Board's Executive Order D-79-2 dated March 6, 1980 to include 1981 model year gasoline powered vehicles in the exemption of the "Filter King Model No. 4" and "Filter King Model No. 5" fuel control device from the prohibitions of Vehicle Code Section 27156.

Enclosed please find Executive Order No. D-79-3 exempting your device described in the staff report (also enclosed) as per your request.

If you should have any questions concerning your exemption, please contact Mr. John Chao, Manager, Aftermarket Parts and Modifications Evaluation Section, at (213) 575-6839.

K. D. Drachand, Chief
Mobile Source Control Division

Enclosures

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-79-3
Relating to Exemptions under Section 27156
of the Vehicle Code

TECHIMPORT LIMITED
"FILTER KING, MODEL NO. 4"
"FILTER KING, MODEL NO. 5"

Pursuant to the authority vested in the Air Resources Board by Section 27156 of the Vehicle Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-45-5;

IT IS ORDERED AND RESOLVED: That the installation of the Filter King Model No. 4 and Filter King Model No. 5 manufactured by Alberto Malpassi, Italy and marketed by Techimport Limited, 119 Glen Road, Toronto, Canada M4W 2W1, has been found not to reduce the effectiveness of required motor vehicle pollution control devices and, therefore, is exempt from the prohibitions of Section 27156 of the Vehicle Code for installation on 1981 and older gasoline-powered, vehicles with conventional carburetor systems.

This Executive Order is valid provided that installation instructions for this device will not recommend tuning the vehicle to specifications different from those submitted by the device manufacturer.

Changes made to the design or operating conditions of the device, as exempted by the Air Resources Board, that adversely affect the performance of a vehicle's pollution control system shall invalidate this Executive Order.

Marketing of this device using an identification other than that shown in this Executive Order or marketing of this device for an application other than those listed in this Executive Order shall be prohibited unless prior approval is obtained from the Air Resources Board. Exemption of a kit shall not be construed as an exemption to sell, offer for sale or advertise any component of a kit as an individual device.

This Executive Order does not constitute any opinion as to the effect that the use of this device may have on any warranty either expressed or implied by the vehicle manufacturer.

THIS EXECUTIVE ORDER DOES NOT CONSTITUTE A CERTIFICATION, ACCREDITATION, APPROVAL, OR ANY OTHER TYPE OF ENDORSEMENT BY THE AIR RESOURCES BOARD OF ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF THE "FILTER KING MODEL NO. 4" AND "FILTER KING MODEL NO. 5".

TECHIMPORT LIMITED
"FILTER KING MODEL NO. 4"
"FILTER KING MODEL NO. 5"

No claim of any kind, such as "Approved by Air Resources Board" may be made with respect to the action taken herein in any advertising or other oral or written communication.

Section 17500 of the Business and Professions Code makes untrue or misleading advertising unlawful, and Section 17534 makes violation punishable as a misdemeanor.

Section 43644 of the Health and Safety Code provides as follows:

> "43644. (a) No person shall install, sell, offer for sale, or advertise, or, except in an application to the state board for certification of a device, represent, any device as a motor vehicle pollution control device for use on any used motor vehicle unless that device has been certified by the state board. No person shall sell, offer for sale, advertise, or represent any motor vehicle pollution control device as a certified device which, in fact, is not a certified device. Any violation of this subdivision is a misdemeanor."

Any apparent violation of the conditions of this Executive Order will be submitted to the Attorney General of California for such action as he deems advisable.

Executive Orders D-79 dated April 17, 1978, D-79-1 dated January 12, 1979, and D-79-2 dated March 6, 1980 are superseded and of no further force and effect.

Executed at El Monte, California, this 2 day of ~~March,~~ April 1981.

K. D. Drachand, Chief
Mobile source Control Division

State of California
AIR RESOURCES BOARD

March 2, 1981

Evaluation of the Techimport Limited "Filter King Model No. 4" and "Filter King Model No. 5" for Compliance with the Requirement of Section 27156 of the Vehicle Code.

I. INTRODUCTION

Techimport Limited, of 119 Glen Road, Toronto, Canada M4W 2W1, has requested by letter dated January 31, 1981 (See Appendix A) an update to the existing Air Resources Board's Executive Order D-79-2. The applicant requested that the exemption from the prohibitions of Vehicle Code (V.C.) Section 27156 for their "Filter King Model No. 4" and "Filter King Model No. 5" fuel control device be updated to include all 1981 and older model year gasoline-powered vehicles with conventional carburetor systems.

Section 27156 of the V.C. prohibits the installation, sale, or advertisement of any device which alters the performance of the vehicle's emission control system. The Air Resources Board (ARB) is empowered to exempt any device from this prohibition if it can be shown that the installation of the device will not reduce the effectiveness of the existing emission control system.

II. SYSTEM DESCRIPTION AND OPERATION

The "Filter King" device is a fuel pressure regulator installed between the fuel pump and the carburetor. It is designed to maintain the fuel pressure in the carburetor at optimum levels. The applicant claims:

1. By regulating the fuel pressure to supply the engine with the required amount of fuel, the device eliminates most or all of the fuel pulsations emanating from the fuel pump.

2. The device also prevents excess gasoline from flowing into the float bowl during periods of heavy fuel bowl slosh.

3. As a result, the carburetor is able to maintain a more uniform level of fuel in the float bowl, thereby, reducing carburetor flooding and increasing fuel economy.

The device consists of an upper aluminum housing and a lower glass container. The aluminum housing contains a fuel inlet, a fuel outlet, a valve, and a spring loaded diaphragm that regulates the opening and closing of the valve. The lower glass container holds the fuel and a high capacity fuel filter. Figure I shows a cross-section of the device.

Inititally, fuel from the fuel pump under pressure enters the glass compartment where the fuel is filtered. The amount of fuel that passes the valve and thence to the carburetor is metered by the action of the spring loaded diaphragm. When the fuel pressure under the diaphragm is high, the diaphragm moves up causing the valve to seat against the port thus reducing the output pressure. When the fuel pressure is low, the diaphragm moves down allowing the valve to open the port thus increasing the output pressure. The modulation of the diaphragm tends to smooth out the fuel pressure pulsation from the fuel pump. The pressure regulator output pressure can be adjusted by means of a screw located on the top of the aluminum housing.

III. DEVICE EVALUATION

The applicant submitted emissions test data for the original application. The tests, conducted by AMC, were performed on a 1978 AMC vehicle. The data in Table 1 shows that the device has little effect on emissions at low outlet pressures of 1.2 and 1.7 psig.

The ARB evaluated the device during the orignal application. The evaluation consisted of parametric pressure tests at different speed and engine loading conditions on a typical 2 barrel carburetor. The results in Table 2 indicated that the amount of fuel delivered to the test carburetor and emissions were unaffected due to fuel pressure differences.

The Air Resources Board staff report titled "Evaluation of the F. K. Products Filter King Unit No. 5 Device in Accordance with Section 2222, Title 31 of the California Administrative Code", dated February 24, 1978, contains a detailed description of the tests performed.

IV. DISCUSSION

Based on the above data the Filter King does not seem to have any effect on fuel delivery and on exhaust emissions of an automobile engine equipped with a conventional carburetor. Since the "engine out" emissions are not changed, the operation and the efficiency of a three-way catalyst does not change either.

Also when the fuel delivery rate remains unchanged, the float level will not change. An air/fuel ratio feedback control system on late model year cars draws fuel from a bowl in the same way as a conventional carburetor, and should not be affected if the float level does not alter.

V. CONCLUSION AND RECOMMENDATION

The previous test data submitted by the applicant and generated by ARB showed that the use of the "Filter King" device did not have any effect on the exhaust emission control system of 1978 model year vehicles.

Based on the test data Techimport Limited was granted an exemption (Executive Order D-79 dated April 17, 1978) from V.C. 27156 for 1978 and older gasoline powered vehicles. The exemption was later updated to include 1979 model year gasoline-powered vehicles (Executive Order D-79-1, dated January 12, 1979) and for 1980 model year gasoline-powered vehicles (Executive Order D-79-2, dated March 6, 1980).

The staff found no significant difference between the 1981 and 1978 vehicle's fuel system design and the engine-out emissions are not affected by the use of the Filter-King device.

Based on the above, the staff concluded that the installation of the "Filter King Model No. 4" or "Filter King Model No. 5" fuel control device will have no effect on vehicle exhaust emissions. The staff recommends that Techimport's exemption, Executive Order No. D-79-2, be updated to include 1981 and older model year gasoline-powered vehicles with conventional carburetor systems. The staff, therefore, recommends that Executive Order D-79-3 be adopted

Table I - Filter King Back-to-Back CVS-75 Test Data on a 1978 AMC I-3 Package (Test conducted by AMC)

	Grams per Mile			MPG		
	HC	CO	NOx	City	Highway	Composite
Baseline @ 5 psig.	0.52	5.4	1.23	16.6	25.8	19.8
Filter King @ 1.7 psig	0.49	4.1	1.51	17.5	26.5	20.6
Filter King @ 1.2 psig	0.52	5.0	1.32	17.8	27	21.0

% of Max. Torque		Idle	100%	50%	25%	100%	50%	25%	100%	50%	25%	100%	50%	25%
Filter King Output Pressure psig	Baseline	5.5	5.1	4.9	4.3	4.4	4.5	4.6	4.2	4.5	4.5	4.2	4.3	4.4
	Device (1)	5.6	5.2	5.5	5.5	3.5	4.2	4.3	4.2	4.4	4.5	4.0	4.3	4.4
	Device (2)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
	Device (3)	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.0	1.9	2.0	2.0
	Device (4)	1.6	1.6	1.5	1.5	1.5	1.6	1.5	1.5	1.6	1.6	1.5	1.5	1.5
	Device (5)	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.1	1.1	1.0	1.1	1.1
Fuel Flow gm/sec	Baseline	0.9	2.7	1.4	1.1	4.2	2.1	1.4	5.8	2.9	1.9	7.2	3.8	2.4
	Device (1)	0.9	2.8	1.4	1.1	4.2	2.2	1.6	5.8	2.9	1.9	7.2	3.8	2.4
	Device (2)	0.8	2.9	1.4	1.1	4.2	2.1	1.4	5.7	2.9	1.8	7.1	3.7	2.4
	Device (3)	0.8	2.7	1.4	1.1	4.2	2.1	1.4	5.9	3.0	1.8	7.0	3.7	2.4
	Device (4)	0.8	2.7	1.4	1.1	4.1	2.1	1.4	5.7	2.9	1.8	6.9	3.7	2.1
	Device (5)	0.8	2.7	1.4	1.1	4.1	2.1	1.4	5.7	2.9	1.8	6.9	3.7	2.4
CO gm/min.	Baseline	0.70	*	1.4	0.8	*	4.1	1.4	*	9.7	2.9	*	21.6	6.7
	Device (1)	0.80	*	1.3	1.0	*	4.2	1.5	*	13.1	2.8	*	17.9	6.4
	Device (2)	0.65	*	1.2	0.9	*	4.7	1.5	*	11.2	2.4	*	17.6	5.0
	Device (3)	0.67	*	1.0	0.9	*	4.0	1.4	*	12.7	2.3	*	19.4	5.7
	Device (4)	0.7	*	0.9	0.8	*	3.2	1.3	*	10.7	2.1	*	16.8	5.5
	Device (5)	0.7	*	0.8	0.8	*	2.8	1.3	*	7.9	1.9	*	14.1	4.1
HC gm/min	Baseline	0.24	2.3	0.73	0.27	3.21	1.32	0.47	4.03	1.52	0.89	5.15	1.76	1.09
	Device (1)	0.26	2.36	0.81	0.28	3.33	1.40	0.51	4.46	1.91	0.98	5.36	1.83	1.12
	Device (2)	0.23	2.35	0.82	0.30	3.11	1.32	0.50	4.21	1.57	0.89	4.9	1.73	1.01
	Device (3)	0.22	2.18	0.79	0.33	3.29	1.38	0.56	4.58	1.84	0.96	4.9	2.07	1.26
	Device (4)	0.29	2.21	0.76	0.31	2.97	1.26	0.53	4.22	1.89	0.76	4.82	2.03	1.28
	Device (5)	0.22	2.10	0.72	0.32	3.13	1.26	0.80	4.16	1.74	0.94	4.74	1.92	1.18
NOx gm/min	Baseline	0.23	*	2.51	0.51	*	4.42	1.28	*	6.33	2.81	*	9.62	5.03
	Device (1)	0.25	*	2.57	0.48	*	4.40	1.36	*	7.34	3.03	*	9.96	5.13
	Device (2)	0.18	*	2.64	0.51	*	4.22	1.34	*	6.05	2.6	*	9.58	4.43
	Device (3)	0.14	*	2.71	0.50	*	2.94	1.96	*	7.44	2.65	*	10.75	4.37
	Device (4)	0.09	*	2.62	0.46	*	4.00	1.21	*	7.10	2.49	*	10.10	4.01

King Device on Ford 302 CID Engine Dyno

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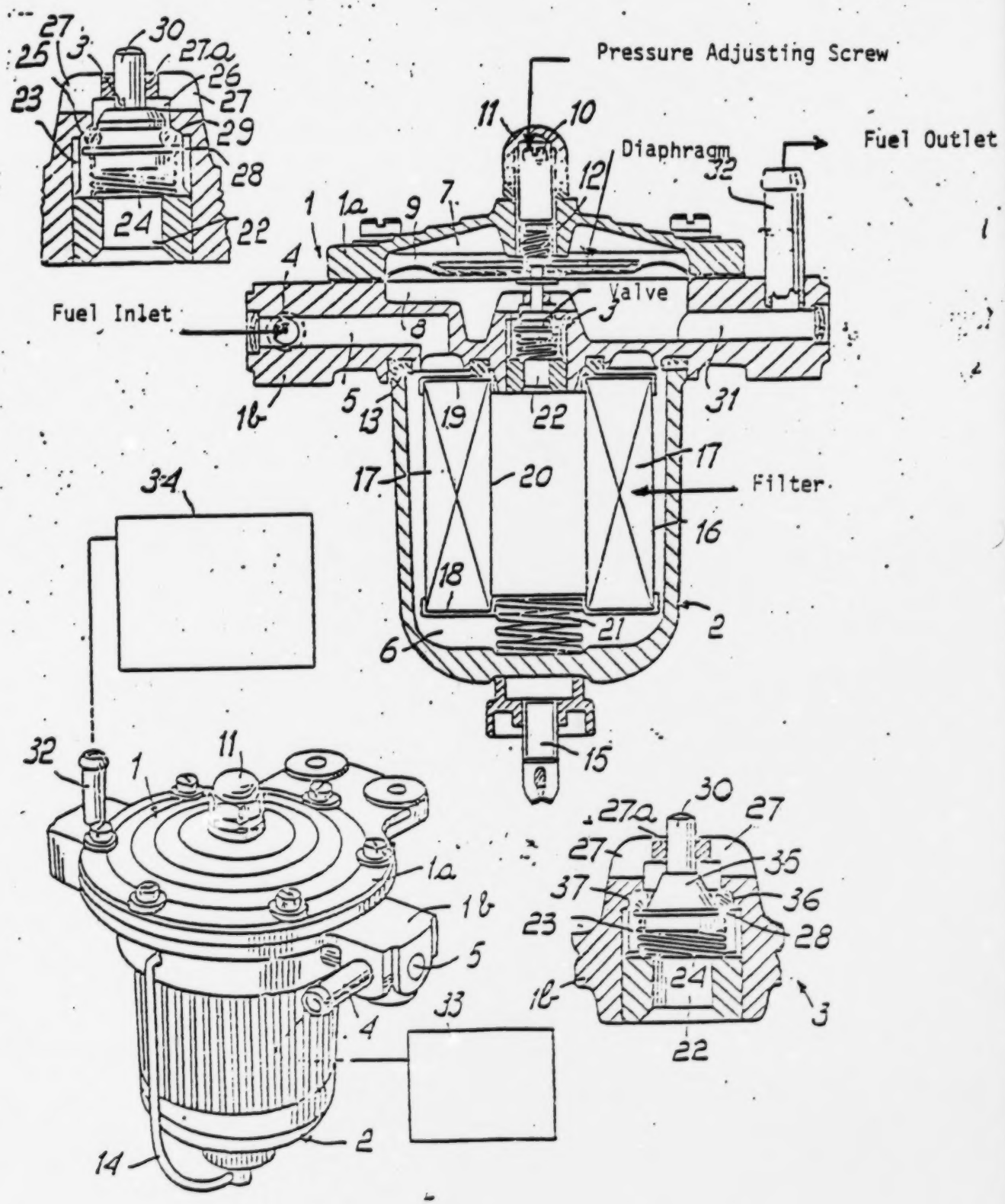

Fig. 1 - Filter King Pressure Regulator

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ANN ARBOR MICHIGAN 48105

April 20, 1982

OFFICE OF
AIR, NOISE AND RADIATION

Mr. R. H. Scrivener, President
Techimport Limited
119 Glen Road
Toronto, Ontario
Canada M4N 2W1

Dear Mr. Scrivener:

We have performed a preliminary review of your February 8, 1982 application for an evaluation of the Malpassi Filter King Fuel Pressure Regulator, a fuel economy retrofit device. Our review also included your letters of February 8, 1982 and all other documents provided to EPA during the past several months. A more complete review will be performed after all test data and any other required information are submitted to us. Our preliminary review has resulted in the following conclusions:

1. Section 3(d) of your application includes a discussion of the testing performed to support the claims made for the Malpassi Filter King. I believe there are several problems with the test data for the reasons stated in Attachment A. Overall, the test data you have submitted do suggest that there may be fuel economy benefits associated with the Malpassi Filter King. However, there is a need for more test data obtained from a carefully controlled program at an EPA-recognized independent laboratory. The test program should include on-road testing of both fuel economy and performance changes attributable to the Malpassi Filter King. Although we have not decided on all the specific details, we suggest you consider the features outlined in Attachment B when designing your program.

   I recommend that you contact independent test labs regarding the program suggested above. Should you find one capable of performing the tests, then please contact me so that we can further discuss the details of the program.

2. Section (5)(a) of your application addresses unregulated emissions and refers to ARB testing and evaluation of the Malpassi Filter King. Based upon our examination of the ARB reports, we believe the ARB evaluation and testing were directed at regulated pollutants, not unregulated pollutants. Therefore, you need to submit information with respect to unregulated pollutants. If you have tested for unregulated pollutants, then please provide us with a description of the tests performed and all test results. If testing has not been performed, then please state so.

Because of our need to process all evaluations in a timely manner, I ask that you respond to this letter by May 4 and that you submit all data by June 4. Should you have questions regarding this matter, please contact me. 56

Sincerely,

Merrill W. Korth

Merrill W. Korth
Device Evaluation Coordinator
Test and Evaluation Branch

Enclosures

Attachment A

EPA's comments with respect to the test data addressed in Section 3(d) of the application are as follows:

1. Paragraph (3)(d)(i) addresses the AMC testing which included both hot soak tests in the Yuma desert and CVS dynamometer tests. There are several problems with that testing. First, as you have stated in several documents, dynamometer testing is unlikely to reveal the full potential of the device due to the atypical amount of fuel bowl sloshing during the test procedure. Second, because AMC vehicles (which have a return fuel line) exhibit fuel pressure pulsation characteristics which differ from those associated with most in-use vehicles (having no return line), the test results might not be indicative of the fuel economy benefits that may be realized with the majority of vehicles today. At best, the test results should only be used to predict what may happen with vehicles that have a return fuel line. Third, only one vehicle was tested. Fourth, the data summary attached to the November 28, 1977 AMC letter to Mr. Coulter shows that a) of 23 CVS tests, some were performed with a Filter King #5 while others were with a Filter King #3, b) some tests were run with no return line while others were with the return line, c) only three tests were run in the configuration which yielded the most improvement in fuel economy, that being the 1.2 psi pressure setting, d) of the three tests run with a 1.2 psi setting, only two were complete test sequences, i.e., both FTP and HFET and these two tests were apparently compared to the last three baseline tests to obtain a 6 percent improved combined MPG fuel economy. As we see it, the 6 percent improvement is not based on "hard data" using 23 CVS tests but rather from 5 tests, i.e. two with the device set at 1.2 psi and three baseline. Based on EPA's current guidelines, five tests on one vehicle is not a sufficient amount of testing. This, combined with the aforementioned shortcomings of using an AMC vehicle and a dynamometer test procedure to indicate what might be realized in fuel economy improvements on most in-use vehicles, makes the usefulness of AMC CVS test results questionable.

   To augment our concerns relative to the AMC test results, it seems there is the possibility the Malpassi Filter King may have been installed incorrectly during CVS testing as well as during the Yuma hot tests. This concern rises from the last sentence of the third paragraph of the Discussion section within the AMC Detroit Research Report No. DR 11-77-91 which was included in the Blue Book. That sentence states, "the configuration and settings resulting from this test series [referring to AMC CVS tests with the 1.2 psi pressure setting] were then adapted to a Western trip car which was currently being tested". If the term

"configuration" includes the method of device installation, then the next sentence which states, "installation was on the wheel well, in an upright configuration, between the fuel pump and the standard AMC fuel filter", would mean the device had been installed incorrectly during the CVS tests. Please clarify as to what method of installation was used during the CVS tests. With respect to the Yuma hot tests, it appears the device may also have been incorrectly installed during testing. For this reason, EPA does not intend to base its conclusions in this reevaluation of the device on the Yuma hot tests. However, we do intend to evaluate the driveability characteristics associated with the device.

2. Paragraph (3)(d)(ii) addresses "independently conducted on-road tests". Admittedly, the 47 referenced tests constitute a considerable amount of testing. However, an examination of the test reports, letters, etc. indicate there are problems with most of the data. For example, some of the test vehicles were not representative of recent models in that they were pre-1973 vintage. Therefore, they did not possess the sophisticated emission controls, carburetor designs, etc. associated with recent models. In some tests, only one vehicle was tested and then without replicate testing. Although the reports are usually not detailed enough to say for sure, it seems that the adequacy in controlling test variables may not have been sufficient for a large number of the tests. In a few cases, back-to-back testing was not performed. We are sure you can appreciate some of our concerns because you have addressed them in your own guidelines for testing which are included in the September 5, 1979 memorandum located within the Section of the Blue Book titled, "Comments on Testing". Although most of the tests are inadequate for our purposes, there are some that are satisfactory enough to indicate that there may be fuel economy benefits associated with the Malpassi Filter King and consequently additional testing should be conducted.

We have one additional comment with respect to the road testing. Among the test reports, there is one from SCI dated July 12, 1979. The report references an attached table which summarizes the test results. That table was omitted. We would appreciate it if you could provide us with a copy.

Attachment B

Test Vehicles

Quantity: Four
Model Range: 1975 thru 1982
Manufacturers: General Motors, Ford, Chrysler, American Motors
Number of Engine Cylinders: 8, 6, and 4
Transmission: Automatic
Fuel Line Configuration: Non-return line (except with AMC vehicles)

Test Conditions

Test Type: On-Road testing

It is suggested that all on-road testing be performed on the San Antonio Road Route which is described in Attachment C. Should you select some other test location, it will be necessary to run a few pilot tests for purposes of establishing the test-to-test variability and also the required number of test vehicles/tests.

Test Quantity:

1. Twelve valid tests without device per vehicle

2. Twelve valid tests with device per vehicle

Temperature Range: 60°F to 90°F
Wind: 5 MPH or less, gust to 10 MPH maximum.

Miscellaneous Comments

1. All testing should be conducted between 9:00 a.m. and 3:00 p.m.

2. Two or more practice runs should be made to assure driver repeatability.

3. One warm-up run should be made prior to start of data gathering.

4. Device should be installed with bypass valves in such a manner as to allow fuel to flow through it or to bypass it, as desired by test personnel.

5. Tests with and without the device should be randomly mixed during each day. Test personnel (other than the driver) should manipulate the bypass valves so that the driver has no knowledge of when the device is actually functioning.

6. Testing should be shared equally between two drivers.

7. After all fuel economy test runs are completed, the vehicle should be subjected to triplicate wide-open throttle (WOT) acceleration runs of 0 to 60 MPH both with and without the device.

8. Driveability should be evaluated under "hot soak" conditions at temperatures above 90°F. The evaluation should consist of running the vehicle at 55 mph, then stopping the engine for 15 minutes followed by an engine restart and WOT acceleration back to 55 mph. This sequence should be performed a minimum of three times.

Appendix D
Road Testing with the Gastell Device

SAN ANTONIO ROAD ROUTE TEST PROCEDURE

A. The general procedure is as follows:

1. Drive test vehicle from Southwest Research Institute to Layover Point.

2. Start Vehicle

3. Start Fluidyne Recorder, wait 60 seconds. Then drive road course. Use normal driving techniques.

4. Return to Layover Point, shift into park, idle for 60 seconds. At 60 secs, stop Fluidyne totalizer and hit print button. Record fuel and temperature readings on work sheet.

5. Shut engine off, zero and start Fluidyne timer.

6. At 500 seconds, start vehicle using hot start procedure.

7. At 560 seconds shift into drive and drive road course using normal driving technique. (Go to Step 4 - repeat as many times as possible before 3:00 p.m.).

Note: The Mercury Marquis was run with 60 second layovers instead of 500 seconds.

B. General Test Requirements

1. The first test run of each day was considered warm up and the data was not used in any subsequent calculations.

2. Only tests run between 9:00 a.m. and 3:00 p.m. were used due to San Antonio traffic considerations.

3. Only tests run on weekdays, Monday through Friday, were used due to San Antonio traffic considerations.

4. Temperature, humidity, barometer, wind speed and direction were taken at 9:00 a.m. and 3:00 p.m.

5. All test fuel was from a single batch of Gulfpride unleaded fuel provided by Southwest designated EM-356.

6. All test vehicle fuel tanks were drained prior to start of testing to avoid fuel mixing.

7. All vehicles were specification checked and examined for proper vacuum line routing and evidence of tampering.

8. The Chevrolet Citation and Nova were extensively checked out to manufacturers specifications at the EPA-MVEL prior to being driven to San Antonio.

9. Fuel Tanks on each vehicle were filled with EM-356 fuel each morning. Vehicles used about 1/4 tank each testing day.

10. Tire pressure of all test vehicle tires was checked and set to manufacturer's specifications each morning prior to leaving Southwest Research.

11. Test runs with abnormal time, fuel consumption, or circumstances were deleted from consideration. Examples of such circumstances were funeral processions (3 occurences) and could not exit highway due to traffic (1 time).

12. In all test days where the Gastell Device was to be used, the device calibration was checked prior to leaving Southwest using the following procedure.

    An 8" diameter pressure gauge that was previously checked versus a mercury manometer in Ann Arbor was attached to a hand vacuum pump which was then connected to the device. Ray Smith of Gastell had transmitted the following device specifications:

	ON	OFF
4 cylinder vehicles	3.5" Hg	4.5" Hg
6 cylinder vehicles	5.0" Hg	6" Hg
8 cylinder vehicles	7.0" Hg	8"Hg

    The devices did not need calibration until the setpoints were modified on the Nova. The calibration checks of the 8 cylinder devices were about on at 7.0" Hg. Since these devices were submitted by Ray Smith with the 511 Application for evaluation and the specifications given in the application only specified the ON set point, the devices were deemed acceptable.

13. Testing run when the pavement was wet was not used in the analysis. When pavement was damp the results were used if they appeared in-line with other measurements.

14. A minimum of 5 tests were run with most vehicles to familiarize the driver with the vehicle and route. Data was not collected during driver familarization.

15. The fuel totalizer display was located in the vehicle so that the driver could not see the display while driving.

16. The Fluidyne flowmeters were calibrated in July, 1980 and checked for calibration in December 1980.

San Antonio Road Route

Number of Stop Signs: 0

Number of Stop Lights: 28

Average Distance: 7.2 miles

Average Speed: 19.6 mph

Maximum Speed: 55 mph

Stops/Mile: 3.9

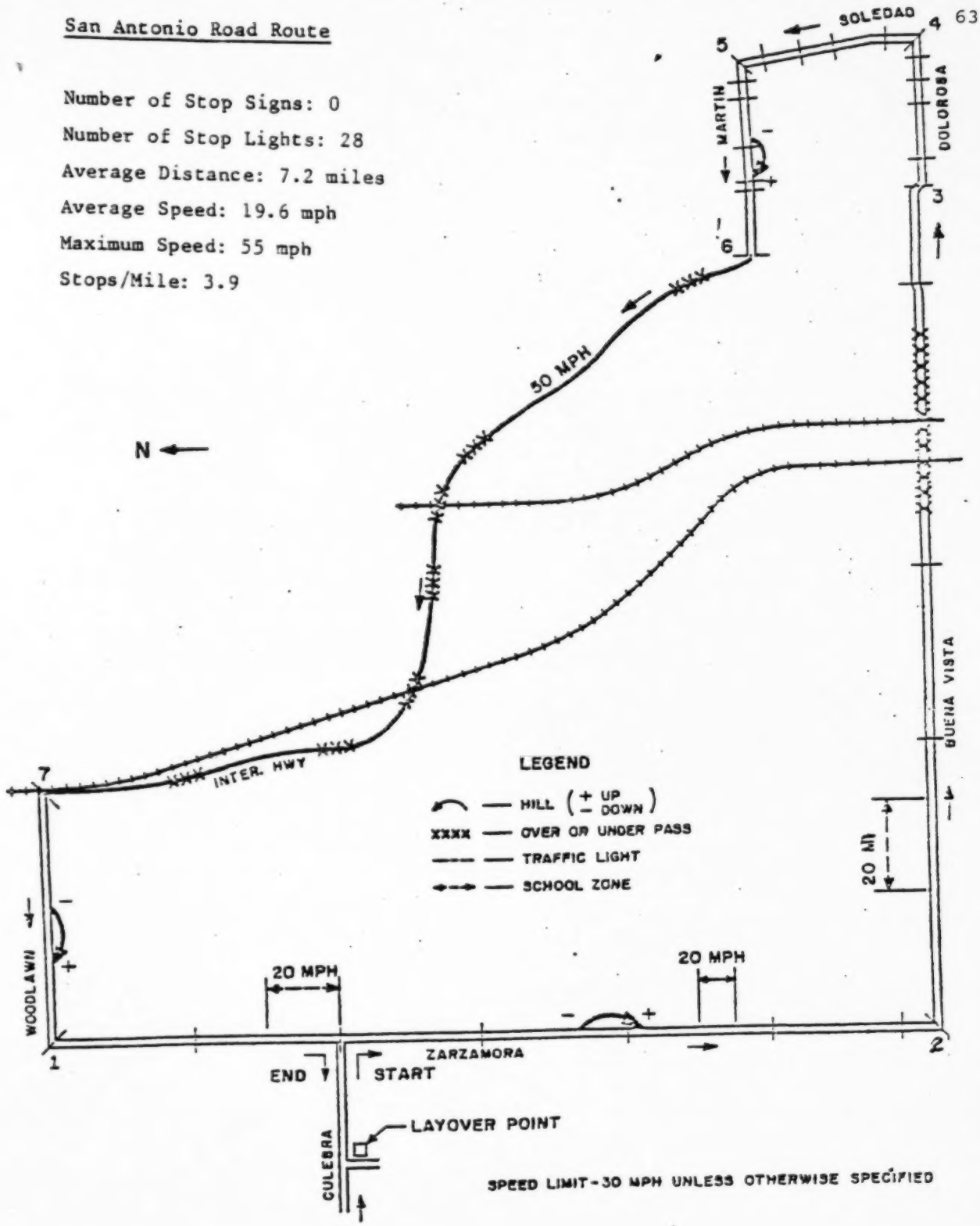

Figure D-1 San Antonio Road Route

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ANN ARBOR, MICHIGAN 48105

June 24, 1982

OFFICE OF
AIR, NOISE AND RADIATION

Mr. R.H. Scrivener, President
Techimport Limited
119 Glen Road.
Toronto, Ontario
Canada M4N 2WI

Dear Mr. Scrivener:

I have received your June 9 response to our April 20 preliminary evaluation of the Malpassi Filter King. Your letter had apparently crossed our June 7 letter in the mail.

In the second paragraph of your letter, you expressed your position with respect to the AMC testing of the device. Specifically, you state that the findings and conclusions "stand as an accurate representation of the effects of the Filter King on fuel consumption". Additionally, you state it is surprising that anyone "would question the applicability of the Filter King to other vehicle makes, since the fuel pump/carburetor systems of all vehicles function in the same way, with any differences being minor and not related to the fuel pulsation/fuel bowl slosh problems that the Filter King deals with".

I am surprised that you make such statements considering that they seem to take a different position from that stated, or implied, by Peter Coulter in various letters to this Agency (see Enclosure). For example, your statement that the AMC test results "stand as an accurate representation" reflects a different position from that taken earlier with respect to dynamometer testing of the Malpassi Filter King. FTP and HFET dynamometer testing does not include on-road vehicle vibrations and therefore the effectiveness of the device in coping with carburetor fuel bowl sloshing (which is caused in part by the on-road vibrations) cannot be adequately assessed. This concern was expressed by Mr. Coulter in several letters to EPA (Letters A, B, and C) and was also noted by Professor Huf during his testing of the device (Document D). This concern was also expressed by EPA to Mr. Coulter (Letter E). Even if one were not to consider the other problems associated with the AMC testing which were noted in Attachment A of my April 20 letter, the AMC data would at best, only indicate the effectiveness of the device on vehicles traveling on extremely smooth roads, absent of turns, accelerations, and decelerations. Certainly, this is not representative of most driving conditions. For these reasons, EPA determined that the AMC test results do not "accurately represent" the effects of the Filter King on fuel consumption and therefore proposed an alternate test plan for evaluating the device on the road.

Your other statement regarding the applicability of the device is also surprising in that Mr. Coulter previously stated (Letter F) that "AMC fuel systems have an in-line fuel filter with a return line on the down stream (exit) end. The effect of this return line is to bleed off fuel from the fuel line, and therefore to intermittently bleed off pressure, and this effect significantly increases the strength of the fuel line pulsations. In this situation, the strength of the fuel line pulsations by themselves are sufficient to lead to an observable loss of fuel economy." The above statement was included in a letter in an effort to explain to EPA why the device caused a fuel economy benefit on the AMC vehicle (when dynamometer tested without road simulated vibrations) while the benefit is not realized on other vehicles not having a return fuel line. A similar position was also taken in another letter by Mr. Coulter to EPA (Letter G). Because the fuel line pulsation characteristics with AMC vehicles are significantly different from those noted with non-return line vehicles, and also because AMC vehicles constitute a small portion of the total U.S. car sales, the AMC data were judged by EPA to be not representative of, or "applicable" to, the majority of in-use vehicles. With respect to fuel pump/carburetor design/function, EPA agrees that generally there is basically little difference between AMC vehicles and those of other makes. A more important difference that may exist is that some carburetors have baffles within the fuel float bowl to control sloshing while others do not. In general, our concerns were not with fuel pump/carburetor design/function, but rather with pulsations.

You stated in your letter that you "will be seeking to finance" the kind of testing suggested by this Agency. While we were pleased to see you are considering to test the device, we were also concerned about the absence of dates when the testing would take place and when we could expect to receive the results. Because it is essential that we process all evaluations in a timely manner, and also because you have already had approximately two and one-half months to complete your testing of the device, we ask that your test plans (including dates) be submitted to this office by July 8. Should we not receive the information by that date, we will proceed with completing the evaluation using all available data. A copy of the final report will be sent to you prior to its announcement in the Federal Register. The name of the device will also be placed on our list of evaluated devices which is made available to the public. Should you have questions concerning this course of action, please contact me.

Sincerely,

Merrill W. Korth
Device Evaluation Coordinator
Test and Evaluation Branch

Enclosure

Enclosure

A Letter, Peter Coulter to EPA, November 8, 1977. (Page one, first paragraph, and item 1.)

B Letter, Peter Coulter to EPA, May 19, 1978. (Page two, second paragraph.)

C Letter, Peter Coulter to EPA, February 16, 1979. (Page six, item 5 (c).)

D Application for evaluation of the Malpassi Filter King, November 8, 1977. (Page five, item 6, second paragraph including items (a), (b), and (c).)

E Letter, EPA to Peter Coulter, January 18, 1978. (Last paragraph.)

F Letter, Peter Coulter to EPA, February 16, 1979. (Page three, Section 1, second paragraph.)

G Letter, Peter Coulter to EPA, May 19, 1978. (Page one, second paragraph.)

Note: The above listing constitutes only a partial examination of the files.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ANN ARBOR, MICHIGAN 48105

OFFICE OF
AIR, NOISE AND RADIATION

July 22, 1982

Mr. R.H. Scrivener, President
Techimport Limited
119 Glen Road
Toronto, Ontario
Canada M4N 2WI

Dear Mr. Scrivener:

We have reviewed your July 13 request for an extension of the date for when your test plans for the Malpassi Filter King are to be submitted to this office. After carefully considering the ongoing evaluation program and your request, we have decided to grant the extension you requested. This decision was made despite the lengthy delays already noted in your submittal of test plans and the need for us to complete all evaluations in a timely manner.

We ask that your test plans be submitted to this office no later than August 31 and that all test data be submitted by October 15. October 15 was chosen because it provides you with sufficient time to perform the testing and also because of the necessity to complete all testing before the onset of less stable ambient test conditions.

Should we not receive your test plans by August 31, we will finalize our evaluation using all available information. As stated in my letter of June 24, a copy of the report will be sent to you prior to its announcement in the Federal Register. Should you have questions regarding this matter, please contact me.

Sincerely,

Merrill W. Korth
Device Evaluation Coordinator
Test and Evaluation Branch

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ANN ARBOR, MICHIGAN 48105

November 8, 1982

OFFICE OF
AIR, NOISE AND RADIATION

Mr. R.H. Scrivener, President
Techimport Limited
119 Glen Road
Toronto, Ontario
Canada M4N 2W1

Dear Mr. Scrivener:

We are hereby notifying you of our intended course of action with respect to the EPA evaluation of the Malpassi Filter King.

We have carefully considered the entire evaluation program, including the information and data received and the numerous delays experienced to date. We have also considered the additional time which is still required for you to obtain the required test data. Based on these considerations and the need for us to conduct our evaluations in a timely manner, we have decided to complete this one using the information available at this time. Thus, any information or data henceforth submitted to EPA will be considered part of a new evaluation.

Should you decide to submit a new application for your device, we suggest that it include, but not be limited to, any information we requested in previous letters and test data from on-the-road testing as described in my letter of April 20. I recommend you give us an opportunity to comment on your test plan prior to performing any testing.

As I told you in previous letters, a copy of our final report will be sent to you prior to its announcement in the Federal Register and the name of the device will be added to the list of devices which we make available to the public. Should you have any questions regarding this matter, please contact me.

Sincerely,

Merrill W. Korth
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